FLIGHT
and
AIRCRAFT ENGINEER

Editorial Director G. GEOFFREY SMITH, M.B.E.
Editor - - C. M. POULSEN
Assistant Editor - MAURICE A. SMITH, D.F.C. (WING CDR., R.A.F.V.R.)
Art Editor - - JOHN YOXALL

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams : Flightpres, Sedist, London. Telephone : Waterloo 3333 (50 lines.)

COVENTRY: 8 - 10, CORPORATION ST. Telegrams : Autocar, Coventry. Telephone : Coventry 5210.
BIRMINGHAM, 2: KING EDWARD HOUSE, NEW STREET. Telegrams : Autopress, Birmingham. Telephone : Midland 7191 (7 lines).
MANCHESTER, 3 : 260, DEANSGATE. Telegrams : Iliffe, Manchester. Telephone : Blackfriars 4412.
GLASGOW, C.2 : 26B, RENFIELD ST. Telegrams : Iliffe, Glasgow. Telephone : Central 4857

SUBSCRIPTION RATES : Home and Abroad : Year, £3 1 0. 6 months, £1 10 6.

Registered at the G.P.O. as a Newspaper

No. 1980. Vol. L. December 5th, 1946 Thursdays, One Shilling.

The Outlook

Talking Safety

IT is difficult to see exactly how the new Air Safety Board, mentioned by the Minister of Civil Aviation in the Lords last week, can very seriously improve the situation in any but some long-range matters. In the first place, the terms of reference are too limited—direct action can only be initiated in matters of urgency—and, in the second, the Board, as initially constituted, does not include members with really practical knowledge of present-day operating conditions.

Very rightly, Lord Nathan has more than once stated that his "priorities" in air transport are safety—first, second and third. But what, in fact, *is* safety, and how can a board of enquiry have any appreciable influence on immediate difficulties? The whole matter is wrapped up in technical developments in the very wide fields of radio and radar, of traffic control, and—more important still—of aircraft design.

Immediate safety standards can only be maintained or improved by the operators and the ground and flying staff. These alone, knowing the deficiencies in equipment, the limitations of present air traffic control arrangements, and the flying qualities of the particular aircraft used, are able to provide safety by decisions over each and every separate scheduled flight. At the moment it would seem that, in the interests of safety, there are far more cancellations and diversions than were usual in the pre-war winters when somewhat less potentially lethal aircraft were being used by Imperial Airways. As the facilities and control arrangements improve, so the bad-weather regularity can be stepped up.

In the meantime we suggest that the Board might pay very special attention to means by which the flying characteristics of both present and future transport types can be improved. It is obviously a waste of good time and money to produce and install better blind-approach facilities if, because of the difficult low-speed characteristics of the aircraft, these facilities cannot be used with safety and precision. The best information and indications in the world are useless to a pilot who finds himself physically incapable of holding his aircraft correctly on the glide-path in blind and bumpy conditions. An off-the-record conference with a few airline and charter pilots might give the Board food for both thought and action in this and other important matters.

Civilizing the Service

THE reason for the fact that ratings, privates and airmen have normally, even in the levelled society of the twentieth century, been subjected to boarding-school restrictions and near-prison discomforts in their Service life has always been something of a mystery to the enlightened civilian.

The answers usually given to explain the anachronisms and the considerable differences in the amount of freedom permitted to commissioned and non-commissioned ranks have mainly revolved round the all-important word "discipline." The need for the maintenance of discipline has never been questioned, and the civilian, knowing little of the requirements, has been happy to give way before the arguments of the martial experts.

But, in the back of his mind, the ordinary person—particularly when wars have pulled him into the military machine—has wondered whether such arbitrary restrictions and discomforts were really necessary. Whether, in fact, the whole thing was not a relic of the days of a century and a half ago, when the Army was recruited from the gutter and the Navy by press-gangs from the taverns and brothels of seaports; when, too, the conditions of life for sailors and soldiers were necessarily those from which to escape if at all possible.

The impetus necessary to overcome inertia in such habits of thought must always be great, and reforms, consequently, are always overdue. Those outlined in the

Air Council's latest directive to Air Force commanders will be very welcome, and may do something to remove the bias, out of favour with Service life, which is still hindering recruitment. But more important still is the emphasis placed on the officer's responsibilities towards his men—always a weak point in the R.A.F.

Mention is made of the need for improved dress standards. These have always been painfully low in the Air Force—partly because of the type of work so often being done, but largely because the airman's uniform, as supplied, is not always one in which the wearer can feel proud. If greater initial attention could be paid to material and fit, there would be a better chance of continued smartness. A man with any self-respect can hardly feel his best in an over-long, ill-fitting tunic and heavy, over-sized black boots.

Nevertheless, none of this reaches the core of recruiting resistance. If we are to obtain recruits of the best type, means must be found of making men feel proud to be part of the Service. They will not be encouraged by toffee-apples of different colours. All too often airmen and officers have, in their postings and general treatment, been made to feel that they are unconsidered and unimportant, and that, consequently, the Service as a whole must be an impersonally conducted series of wild mismanagements. That is a very real and fundamental impression which must somehow be removed.

Fido and G.C.A.

IN last week's issue, under Civil Aviation News, we commented on the possible value of Fido and the use to which it should be put. In brief, we said that it could not be considered as a normal aid to transport flying, but that it should be available for emergency use at one or two diversionary fields.

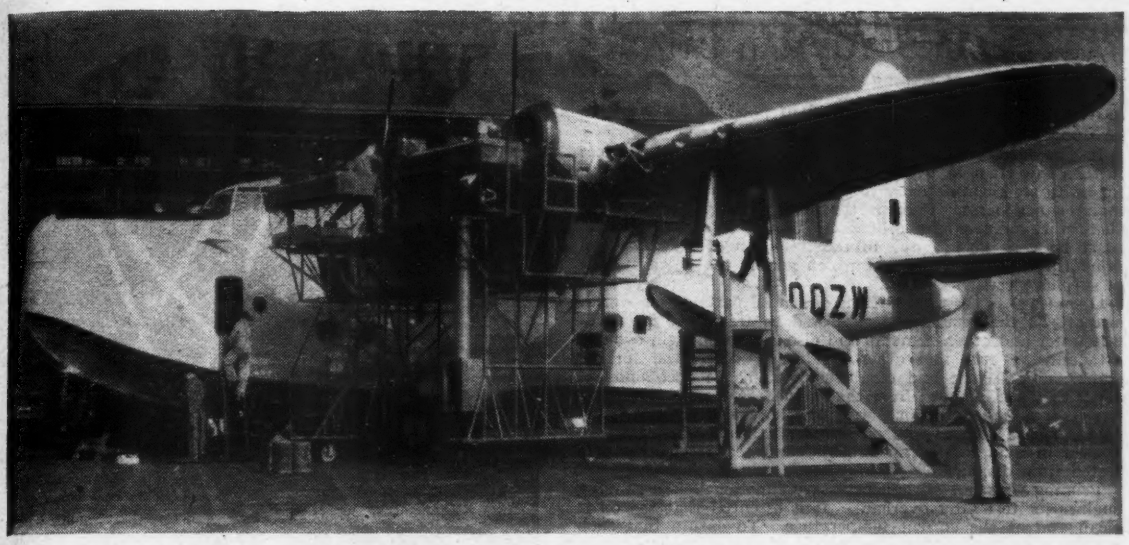
CONTENTS

Outlook	609
Background to Maintenance	611
Cleveland Aero Show	613
Here and There	614
"Operation Sealion"—A Flop	616
American Newcomer	616
Airline Pilot	618
Polar Report	620
Radio at Paris	623
Power Installations	625
Civil Aviation News	628
Correspondence	632
Service Aviation	634

It was interesting, therefore, to learn during the week-end that a decision more or less on these lines had been reached: That the R.A.F. Blackbushe (Camberley) installation is to be put back into experimental use and the airfield taken over by the Ministry of Civil Aviation. Whether or not the results of the tests mean that Fido will eventually be installed at Heathrow, it should be made continuously clear that this fog dispersal and visual aid equipment must always be for emergency use only and not as a normal means of increasing bad-weather regularity of service.

For many months we had been stressing the value of Ground Controlled Approach radar as an interim aid at Heathrow, pending any possible international decision in such matters. A few weeks ago the Ministry decided to proceed with the experimental use of such equipment there. Perhaps voices crying in a wilderness are occasionally heard.

FOR SPEEDBIRD SERVICES: An exclusive *Flight* photograph of *Salisbury* on its initial outing. Geoffrey Tyson is at the controls. The *Salisbury* is the first of twelve Short Solent-class flying boats now building for B.O.A.C.



Engines being overhauled on a Short Hythe flying-boat at the B.O.A.C. maintenance base. Some idea of the economic and safety factors provided by the rostra may be obtained from this photograph.

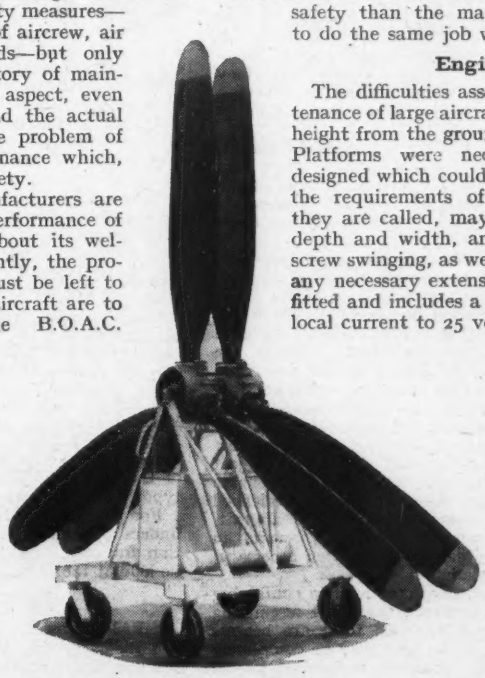
Background to Maintenance

A Visit to B.O.A.C.'s Experimental Factory : Developing Practical Time-saving Equipment

THE chairman of B.O.A.C. recently estimated that twenty-five per cent of the revenue from tickets went to pay for the engineering maintenance of aircraft. That seems, perhaps, at first sight, to be a high figure. On the other hand, it is significant that B.O.A.C. have flown for the past two years on regular schedules all over the world without mishap to a passenger. Much has been written on the more obvious safety measures—such as the experience and training of aircrew, air traffic control and navigational aids—but only occasionally on the less glamorous story of maintenance. And there is yet another aspect, even more remote from the passenger and the actual operation of flying. It concerns the problem of ensuring efficient and speedy maintenance which, in turn, contributes so largely to safety.

It is curious that aircraft manufacturers are usually far too concerned with the performance of their aircraft in the air to bother about its welfare when on the ground. Consequently, the provision of tools and testing devices must be left to the ingenuity of the operator if his aircraft are to give a high utilization figure. The B.O.A.C. experimental factory at Brislington, near Bristol, is established to study methods of maintenance, to develop and, if necessary, produce practical equipment and those furnishings essential for the comfort of passengers. Mr. F. S. Saunders, who has been connected with British airlines for very many years, is the superintendent-in-charge and is personally responsible for much of the work.

The reference to the apparent disinterestedness of manufacturers about the difficulties of maintenance may appear to be exaggerated, but consider one simple little job of work—the process of removing a wheel from a large aircraft, of taking it away and of stowing it until required. Each of the main wheels and tyres of a York or Lancastrian weighs about 6 cwt, is an awkward and dangerously heavy bulk to detach and transport, and so a light stand on wheels was evolved, at Brislington, on which the weight of the wheel was negatived by balance. The idea sounds extraordinarily simple, but the result was that one man was able to do the job with much greater safety than the many had been previously able to do the same job without the special equipment.



On the Transporter the airscrews are compactly mounted in as small a space as possible.

Engine Overhauls

The difficulties associated with the engine maintenance of large aircraft are well known. The units' height from the ground being a problem of its own. Platforms were necessary and structures were designed which could temporarily be erected to suit the requirements of any aircraft. Rostrums, as they are called, may now be built to any height, depth and width, and embodying troughs for airscrew swinging, as well as stairways, guard rails and any necessary extensions. Electrical equipment is fitted and includes a transformer for converting the local current to 25 volts. "Pyrotenax" electrical wiring system is used. This consists of a bare copper tube carrying conductor wires embedded in magnesium oxide. This insulating medium completely fills the tube, which is rendered impervious to oil, petrol, water and changes of temperature, and the tube can be bent to any shape. A bin for waste cleaning-rag, and an air distributor, with connections for both pressure and suction, are supplied. The complete structure is mounted on rubber-covered wheels which render the whole easily transportable, but having jacks to prevent

BACKGROUND TO MAINTENANCE

movement when once it is placed in position for work to be done on an aircraft.

It was fortunate that, after seeing many of such devices in their raw stage at Brislington, an opportunity was provided for us to see them actually in use at one of the Corporation's maintenance bases. Perhaps the most striking impression is that of cleanliness and orderliness in the workshops, which must be very largely due to the provision of rostrums and other tidy making equipment which permit the quick storage of surplus pieces of aircraft.

Operating, as the Corporations do, in all parts of the world, aircraft on the ground are subjected to treatment by sand, salt water and other elements and also, oddly enough, even to attention by rats and other creatures. Airscrews, for instance, are difficult and cumbersome items to accommodate when they are removed from the engine. A transporter stand has been designed to house two airscrews and their relevant parts, such as domes and oil-transfer valves. The parts are housed in dustproof compartments, and are completely protected from damage.

Priming with hot oil is a necessary function before running engines for test after overhaul. It is essential that the oil is clean and at the correct temperature. To ensure that such oil was always immediately available at the maintenance bases, a combined heater-tank and priming unit was especially designed. Heating is done by electric immersion heaters thermostatically controlled at 60 deg C to prevent the oil being either burnt or carbonized. Below the heater tank, housed in a special compartment, is the priming unit, which holds about one gallon. A pressure gauge, pipe connection and a two-speed hand-operated oil pump are incorporated.

The pump handle is so constructed that, by using the short section of the handle, a rapid motion is imparted by which the pipe line is quickly filled and pressure up to 100 lb. per sq. in. obtained. At that point operation becomes difficult and the extra leverage of the longer section of the handle maintains pressure without undue fatigue.

The heater cabinet functions continuously, keeping the oil in the 10-gallon tank at a constant temperature. When oil is required, the operator collects the priming unit, draws off the correct amount of oil and takes the unit to the engine. The outlet cock of the heater tank is provided with a padlock which enables the holder of the key to keep a check on all engine priming.

Instrument Test Rigs

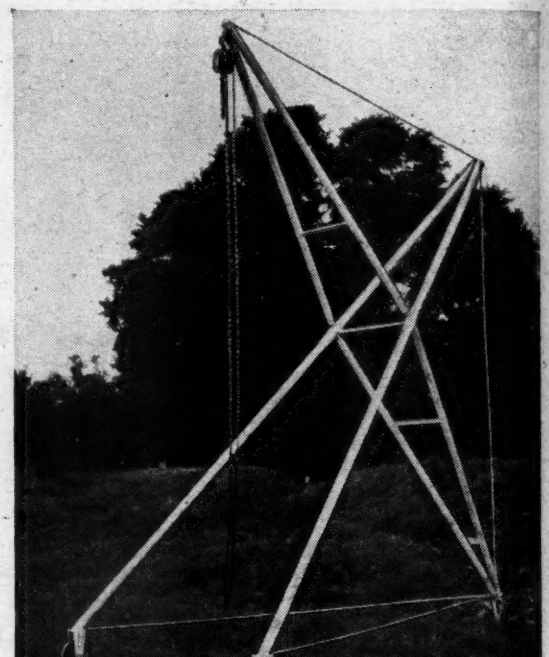
The test rigs for the many aircraft components and instruments are too numerous to describe individually, but they have one common characteristic—simple, clean design with everything but the instruments hidden from view. Another contribution to an orderly workshop.

The fuel pump and flowmeter test rig is a typical example. The power plant consists of a motor and variable speed gear housed in a lower compartment of a bench. In an upper compartment is housed the driving head, which is mounted on a hinged plate providing means for driving-belt adjustment.

The test medium is paraffin, which is stored on each side of the panel. Mounted in the centre are two manometers, one of which registers pressure on the outlet side of the pump under test and the other the suction on the inlet side of the pump. Speed of the driving shaft is indicated on an electrical tachometer on the right side of the panel. Below the manometers is an operating handle for controlling flow from the fuel tanks. The control enables liquid to circulate either from left- to right-hand tank, or vice versa. The whole operation of testing a fuel pump is quick, clean and foolproof.

Perhaps the most interesting item of all is an engine test bed which is in the advanced experimental stage. The object is to eliminate the necessity of making flight tests after engine overhauls. Considerable loss of time is sometimes experienced by operators after engine overhauls while an aircraft, grounded perhaps because of weather conditions, awaits an air test. Even after the test adjustments are often necessary, and further flights have to be made.

The experimental factory has constructed a cabin containing all the normal aircraft's engine controls, somewhat resembling a locomotive driver's cabin, and attached to it are bearers on which the engine is slung. The engine may be completely assembled, run and adjusted in position, and when passed fit for operation the whole may be disconnected at the holding positions and placed in its mounting on the aircraft with no further adjustment. This must result in great economy in engine hours, and enable more reliable planning of maintenance programmes.



This engine-lifting truss is for use where other means, such as cranes, are not available. Being jointed, it can be easily erected, dismantled and transported.

Comfort is probably foremost in the mind of a passenger on a long journey by air. The traveller is not aware of speed or even of any dangers which may be present. B.O.A.C. attach great importance to this, and much of the time at this establishment is taken up in the improvement of seats, bunks, and other internal furnishings. An ingenious water-closet system has been designed, and out of Brislington quite soon will come the first actual flush example for use in aircraft.

A visit to the factory and a tour of the workshops with Mr. Saunders conveyed some idea of the effort behind the organization of the large airlines and the attention to detail which contributes to efficiency and safety.

Although the factory is on the establishment of B.O.A.C., it is at the service of all sections in all the Corporations. Some development work has been done under specifications from Dominion and foreign airlines. The scope is unlimited, and Mr. Saunders' staff will tackle any idea which has the appearance of a ticket-seller, no matter from whom it originates.

PATHFINDERS OUT IN STRENGTH

THE target for a very strong force of Pathfinders on Saturday night, November 30th, was the Royal Horticultural Hall, Westminster. The target area was brightly illuminated, and at zero hour *window* was used at a high rate. Air Vice-Marshal D. C. T. Bennett spoke to his wartime Force and Mrs. Bennett kindly presented prizes to the owners of the lucky numbers in the draw. There was no doubt as to the success of the Grand Pathfinder Dance, the second big affair of the type to be organized by the Association.

For the future it is planned to hold one dance for all Pathfinders and one dance for members of the Pathfinder Association annually. Next year's Pathfinder Association dance is to be held at the Dorchester Hotel on February 15th.

AIRCRAFT PROPULSION

A PAPER by Mr. F. M. Green and Mr. J. E. Wallington on the subject of Aircraft Propulsion was delivered at a joint meeting of the Institute of Mechanical Engineers and the Royal Aeronautical Society last Friday. Sir Frederick Handley Page presided. A summary of the lecture, and of the discussion (opened by Dr. H. Ricardo), will be given next week.

Cleveland Aero Show

Support Rather Disappointing : No Outstanding Products

By "KIBITZER"

FLAGS flew, bands played, Mr. George Bird's Musical Majorettes strutted, a guard of honour of noted pilots formed up. Civic officials and distinguished Army and Navy officers joined the cavalcade (if the latter thought uneasily of the dignity of the uniforms they wore, they did not show it). "Miss American Aviation" cut a ribbon, and with a promotionally bally-hoo that seemed more suited to a circus than to a great nation's accounting of its aeronautical progress, the first Annual National Aircraft Show at Cleveland airport opened its doors to the public. It is doubtful, however, if the public's reactions came up to expectations.

Many years ago, at one of the early British Aircraft Exhibitions, an aviation journalist wearily described the attendance by reporting that "People poured in in ones and twos," and although the visitors to Cleveland made a better showing than that, the numbers were probably lower than the organizers had hoped. Apart from the industry itself, support was not on a national scale, and the number of prospective buyers must have been comparatively small. In fact (except on the awful children's and "Newspaper Boys'" day when any adult who had the stamina to survive was past recognizing anybody) more members of the aircraft trade and the armed services were to be seen than potential private or commercial owners. Nevertheless, most of the manufacturers of the smaller aircraft reported orders.

Such interest as there was in the Commercial Sections centred around the helicopters and the two newest private owner aircraft, the North American "Navion" and the Beech "Bonanza." Otherwise everybody gravitated, quite understandably, to the U.S. Army Air Force and Navy areas where both Services had gone all out to sell themselves to the public, and had done a magnificent job of it. This was particularly noticeable in the case of the Navy whose representation was outstanding. The Navy's Public Relations Division plays fully on the technical achievement theme.

If all this sounds unenthusiastic, remember that these are recorded impressions only, and no attempt has been made to describe item by item the large number of really excellent exhibits that went to make up the whole. Maybe one went there expecting too much, but disappointment is surely permissible when the most revolutionary aerodynamic design that could be found was in the captured enemy aircraft section, and the most advanced power plants shown were the Allison-built Whittle jet and the General Electric T.G.180. The only hint of an airscrew turbine seemed to be a sectional drawing on the stand of the National Advisory Committee for Aeronautics, and where the stand representative announced that an engine was running at the local N.A.C.A. laboratories. (It has since been reported that Northrops had their Turbodyne I, a turboprop engine, on their stand). Whether this absence of really modern designs (for the P.80 and the McDonnell Phantom cannot now be classified as modern) was due to a revival of Security, or whether it was a lack of a clear understanding as to what the show was to represent, does not matter; the net result was disappointing. It was an excellent record of historical achievement, but the shape of things to come was lacking. Reports from Paris indicate that in the Salon nearly every section, and particularly the engines, had more modern equipment to show than at Cleveland.

If however, the future of American aviation remained for the public at large clouded, the present certainly did not. Never could there have been an exhibition where there was so much animation and so much going on at one time—nor for that matter where so many people were talking at once through loudspeakers, or from movie screens. Housed in a huge wartime-built bomber plant right on the edge of Cleveland Airport, with a floor space so big than the Army Long-Distance B.29 was lost amongst the exhibits, it was immediately obviously that any enthusiastic small boy of average health could be there for a week and still not have exhausted its possibilities. Movies, camera-gun recordings, things to pull and things to push, working models of engines, and practically every training device ever produced by those most prolific of gadgeteers, the U.S. Navy Special Devices Branch, were there. One could fire machine-guns, fly the most modern Link trainers, work the engineer's panel of a P.B.M. flying boat, or just sit in a cockpit and push the rudder pedals. If one got bored with that, an indefatigable army lieutenant would give a lecture on captured aircraft and show one films of the launching of the V-2; while all the time a brassy voiced sergeant begged and beseeched everybody to ask all the questions they wanted—and with such pleading that one felt positively guilty for not doing so.

A general view of the National Aircraft Exhibition which opened in the Fisher factory at Cleveland Airport on November 15th.

Air Comfort on the Ground

If one could tear oneself away from these and similar fascinating pursuits, there were many other interesting things to be seen. A lot of the stand layouts were superlative, noticeably those of Lockheed, Martin and Consolidated Vultee. The former relied mostly on models and imaginative backgrounds, but Martins exhibited a cutaway fuselage of the 202 which was so luxurious that it would have sold air travel to the director of a railroad. (In fact, it was so comfortable that somebody was always asleep in one or other of the seats, but as the occupants were of all ages and changed from time to time, they were presumably exhausted visitors.)

In the engine section a working cutaway model of the Pratt Whitney 4360 Major engine was the most outstanding exhibit. It was of such excellence and ability that, combined with the considerable size of the engine itself, it made other equally interesting but less spectacular items look dull and unimaginative. Lycoming showed a mock-up of their big 5,000 h.p. engine, but it was somehow unconvincing, and one immediately wondered how on earth an airline could ever maintain it, and keep to a schedule!

(Owing to lack of space the rest of "Kibitzer's account of his impressions have had to be held over till next week.)

HERE AND THERE

Paving the Way

THOSE who heard Grp. Capt. A. F. Bandit's wireless talk the other day on his plans for an "airborne" attack on Mount Everest, must have been mildly surprised to hear that such a project will probably take most of three years to organize.

At present, Grp. Capt. Bandit, who is attached to Miles Aircraft, is on his way to his native Australia in a Gemini, and he hopes to take the preliminary steps towards his Everest ambition by interviewing various personalities in India on the way there.

Special R.Ae.S. Meeting

AS a necessary preliminary step in the seeking of a grant of a Royal Charter of Incorporation, the council of the Royal Aeronautical Society has come to the conclusion that its existing rules will have to be redrafted.

A draft of the new constitution is ready to place before members for their consideration at the annual general meeting on January 23rd next, but as some of the existing rules under which that meeting will have to be convened are likely to create interminable delays and difficulties, it has been decided to hold a special general meeting on Friday, December 20th, in order to suspend certain "awkward" rules and substitute a simpler procedure.

Changes at de Havillands

MR. C. D. BEAUMONT, ex-R.A.F. instructor and test pilot, has been appointed chief test pilot to the de Havilland Engine Co., Ltd., in place of Mr. John Cunningham, who succeeded the late Geoffrey de Havilland as chief test pilot to the de Havilland Aircraft Co., Ltd.

The former company also has a new service manager in the person of Mr. J. W. Cameron, who for some years held a similar post with Napier and who will make his headquarters at the turbine factory at Edgware.

SEEN FROM THE 'NENE': The world's first jet-powered airliner, the British Nene Lancastrian, gives its occupants a good view of the Eiffel Tower and Seine bridges. Note the feathered airscrew of the inboard Merlin.

Yet Again!

THE Constellation of American Overseas Airlines which on November 20th set up a New York-London record in 12 hr 7 min (305 m.p.h.) knocked nearly two hours off this time last Sunday when, on a normal scheduled flight from La Guardia Airport carrying 1,621 lb of freight and a crew of seven, skippered by Capt. Cameron Robertson, it reached London Airport in 10 hr 12 min, at an average speed of 324 m.p.h.

On the same day another Constellation, *Arnham*, owned by K.L.M., set up a record for the New York-Amsterdam flight in 12 hr exactly.

Verboten

CONSIDERABLE interest is now being displayed by model builders in miniature rocket propulsion units, and the Association of British Aeromodellers issues a timely warning in the current number of the *A.B.A. News* against any temptation to experiment in the manufacture of model rocket units.

There happens to be a law forbidding the manufacture of explosives by any one other than persons or firms licensed to do so under the Explosives Act, which rules out home-made model rocket units. As the job would obviously be decidedly dangerous for an amateur to tackle, this is probably just as well.

They can, however, be bought, though we understand the supply is at present a very limited one, but interested modellers can learn all about this from the A.B.A., whose headquarters are at 70, London Road, Leicester.

BENEVOLENT BIRD: The Stork, traditional emblem of new life, certainly gave renewed life to passengers and crew of the Dakota forced down among the Alps. This Fieseler Storch, with wheel and ski undercarriage, had just landed at Meiringen with two of the rescued.

Airship Licence No. 1

AT the time of writing, mystery still surrounds the discovery of Airship Licence No. 1, issued to the late Major G. H. Scott, C.B.E., A.F.C., which was found by a Bedford schoolboy one morning last week about 1½ miles from Cardington. The boy was on his way to school and found the faded little book among some leaves; the mystery, of course, is how it got there.

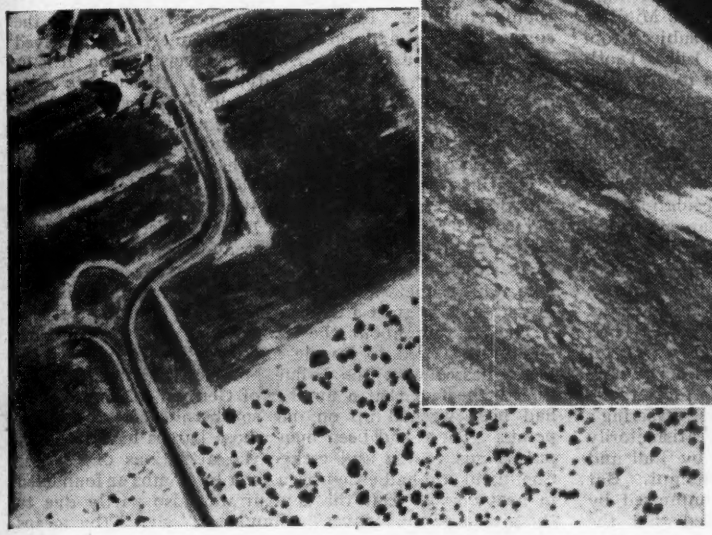
Major Scott, who was killed in the R.101 in 1930, was issued with this licence in 1921, but in 1917 he had captained the R.9, the first British rigid airship to fly, and in 1919 was captain of the R.34, which made history by being the first aircraft to make the double crossing of the Atlantic.

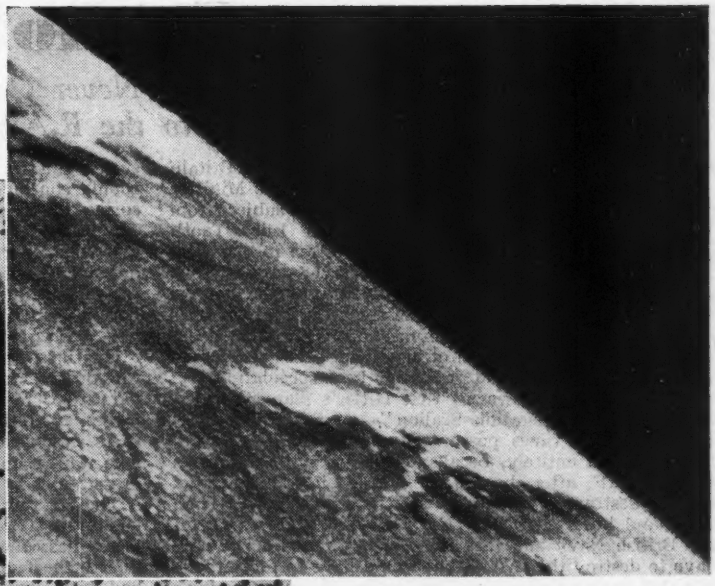
Anti-dingo Drive

A DINGO, in case you don't know, is a species of wild dog found in Australia, and as nothing much could be done during the war years to keep them down, these pests have become a very

HERE AND THERE

MOVIE-CAMERA'S "ALL-TIME HIGH"





A camera in a V.2 rocket fired in New Mexico filmed the earth from 100ft. up to an altitude of 65 miles; these two "stills" represent 1,000ft. and the climax which takes in 40,000 sq. miles. Note curved horizon.

serious menace to sheep farmers in certain parts of the Commonwealth.

Last July experiments were carried out in dropping poison bait from aircraft, and now an intensive campaign has been started in which a D.H. Dragon belonging to Qantas is to be used.

More than 360,000 strychnine baits are to be dropped over routes totalling more than 6,000 miles in Queensland, and the job will last for three weeks, various known breeding grounds being covered from Cloncurry, Mt. Isa, Darjarra, Boulia, McKinlay, and Julia Creek.

Another and even bigger campaign against the destructive dingo is to be instituted next spring in Queensland, and other States are expected to follow suit if the present operation shows good results.

Interim Activity

A SUBSTANTIAL order for the conversion of wartime bomber aircraft for training purposes which would tide them over the period until production started on the new P.108 turbine-airscrew, 3-seater trainer was mentioned at the recent annual general meeting of Boulton Paul Aircraft, Ltd., by the firm's chairman, Mr. R. G. Simpson. Their design department, he added, was very fully occupied with development orders for aircraft and armament.

News in Brief

THREE Australian timber men have chartered an aircraft at £5 10s per flying hour to make a 3,950-mile flight from Victoria to Borneo and back. This works out at 4d a mile each.

* * *

A committee set up by the Australian Civil Aviation Department to deal with applications for permission to operate air services dealt with 80 such applications at its first meeting recently. These covered some 250 different routes.

* * *

The first of a number of Douglas DC-4 aircraft ordered by the Swiss from the American makers, was flown non-stop from New York to Geneva in 16hr 31min last week by a pilot of Swissair.

* * *

Associated Iliffe Press has taken over *The Architect and Building News*, which will continue to be edited by Mr. W. L. Wood. The entire staff of this old-established journal will retain their positions under the new control, and editorial policy remains unchanged.

* * *

In *Flight*, October 24th, it was mentioned that Grp. Capt. Wynter-Morgan had been awarded the U.S. Legion of Merit. Owing to peculiar spacing in a tape-machine message, however, this was wrongly taken to be included in the Degree of Legionaire section, whereas in fact the award was of the higher Degree of Officer.

* * *

A special event to celebrate the Golden Jubilee of the Ernest Turner Group, founded on July 1st, 1898, is to be held by this concern next summer. In view of this, the usual annual dinner in December has been cancelled this year.

* * *

The first lecture in a series on colour photography, entitled "Colour and its Reproduction," was given recently by Dr. H. V. Walters at a joint meeting of the Colour, and the Scientific and Technical groups of the Royal Photographic Society of Great Britain.

* * *

A continuous-type rolling mill costing more than £2,500,000 is being constructed on a 100-acre site at Rogerstone, near Newport (Mon), by the Northern Aluminium Co., Ltd. A planned output of 50,000 tons of sheet products per annum will provide several thousand jobs which did not exist before the war.

AIRSTRIP . . . . No. 42

D

"Operation Sealion"—A Flop

The German Invasion that Never Came Off : Thanks Largely to the R.A.F.

THE account of the threatened invasion of Britain by German forces as given by the Prime Minister in his written reply to questions on the subject from Wing Cdr. Hulbert (Stockport) and Sir Lucas-Tooth (Hendon South) served to give official stress to the vital part played by the R.A.F. during one of the most perilous periods in our country's history. Much of the general story was already widely known, of course, but Mr. Attlee's detailed description, gleaned from captured German documents and the interrogation of important prisoners, served to clear up much that had previously been speculation.

It is now clear, however, that Hitler's plan to launch his invasion—"Operation Sealion"—on September 21st, 1940, was four times postponed and finally abandoned, largely, if not entirely, because of the mounting strength of the R.A.F. after the *Luftwaffe* had failed in its initial task of destroying it. From the start the German High Command knew that their Navy would be no match for the British Navy and that the *Luftwaffe* would not only have to destroy the R.A.F. but would have to prevent the Royal Navy from attacking their landing forces. Goering's confidence that his Air Force could cope satisfactorily with this double task was, it seems, shared by Jodl and Keitel, who were quite ready to make the attempt. But the German naval authorities were not so impressed by the cocksure Hermann and seriously doubted that the *Luftwaffe* could pull off this "double"; they thought that even if it squashed the R.A.F. it would not be able to hold off the British Navy and give the necessary protection to a seaborne landing force—and how right they were!

As the world has known from the time it happened, the R.A.F. immortal "Few" roundly defeated the *Luftwaffe* in the Battle of Britain and then pounded the German's invasion barges across the Channel to such effect that on September 19th Hitler ordered the concentrations of craft to be dispersed, and postponed "Operation Sealion." On October 12th it was again postponed until the following spring, but it was ordered that "deceptive measures" should continue. They duly continued right through the spring of 1941 and on into the summer, and received adequate discouragement from the ever-growing R.A.F. and Allied Air Forces. In July, 1941, Hitler once more ordered postponement until the following spring, but for the fourth time he had to put it off, as the Russians stubbornly refused to be beaten. After that the idea seems to have been quietly dropped altogether.

One interesting side-light on the German invasion plan revealed by Mr. Attlee was that it was only intended to use paratroops for the capture of Dover, whereas it will be remembered that during August and September of 1940 there was hardly a Home Guard in the whole of Britain who wasn't, metaphorically speaking, sharpening his pike in readiness to greet a descending pair of Hun pants!.

The rumour, about the same time, that the Germans had indeed tried to invade and had been repulsed with heavy losses was, the Prime Minister explained, partly due to the fact that a number of German soldiers' bodies had been washed up on our southern coast at various points. These had been men whose barges had no doubt put to sea to try and escape the attentions of Bomber Command and had either been sunk by bombs or foundered in heavy seas. But the rumour was also partly due to the giving of the "invasion imminent" signal (by means of the codeword "Cromwell") at 8 p.m. on September 7th, when all the known conditions pointed to its probability.

Another rumour—or rather, a particular form of the general rumour of a defeated invasion attempt—was that the R.A.F. had poured thousands of gallons of oil on the sea among the approaching invasion fleet and set it alight, thus literally "burning their boats" for them. But Mr. Attlee's reference to the rumour and its causes made no mention of this grim, but widely circulated story.

There was, as he said, no evidence that the Germans ever left harbour as a fleet to invade this country.

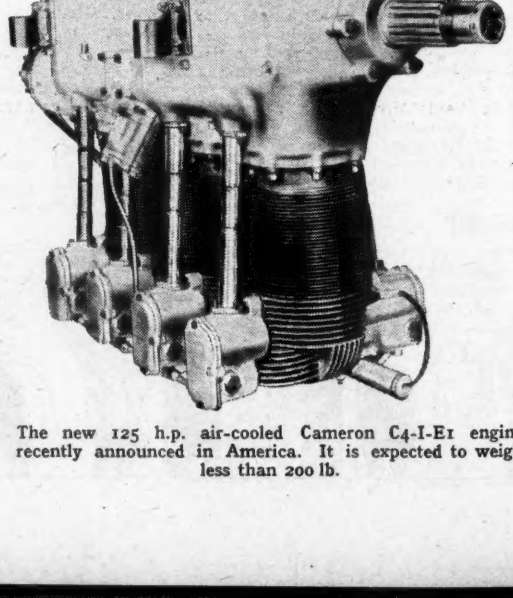
American Newcomer

Some Details of the Smallest of Three Cameron Light Aircraft Engines

FOLLOWING the announcement, welcomed by light aircraft enthusiasts in this country, that the Nuffield Organisation is to produce a new flat-four, comes news from America of a series of three aircraft engines in the lower-power class to be produced under the direction of Mr. E. S. Cameron, who has hitherto been chiefly associated with automobiles.

The first Cameron product, the C4-I-E1, is to have a number of novel design features. It is an air-cooled, four-cylinder, in-line unit developing 125 h.p. at 2,500 r.p.m. and the weight, when in production, will, it is hoped, be under 200 lb. The Cameron Aero Engine Corporation of Reading, Pennsylvania, have also designed and plan to produce later a 185 h.p. six in-line and a 370 h.p. inverted vee-twelve unit. The first model, the four in-line, may be installed inverted or upright according to requirements, a small modification to oil pipes being the only alteration needed.

Design and production of the major components for the most part follows normal up-to-date practice. However, the cylinder-head and valve arrangement are unique. The valves are push-rod operated, horizontally opposed and positioned transversely across the engine. They operate in a U-shaped recess in the cylinder head. One purpose is that the cool induction charges should flow on to the exhaust valves, thus helping to cool them, and at the same time completing the vaporization of the charge. It is



The new 125 h.p. air-cooled Cameron C4-I-E1 engine recently announced in America. It is expected to weigh less than 200 lb.

CAMERON C4 DATA

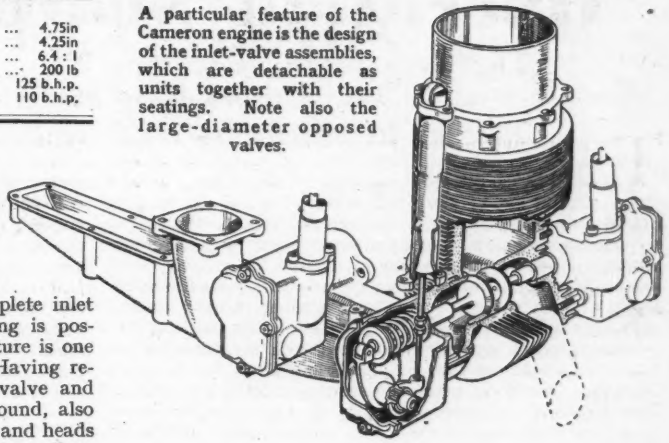
Bore	4.75in
Stroke	4.25in
Compression ratio	6.4 : 1
Weight	200 lb
Rated power (at 2,500 r.p.m.)	125 b.h.p.
Cruising power (at 2,200 r.p.m.)	110 b.h.p.

said that a higher compression ratio can be employed without the use of high-octane fuel. The valves are of unusually large diameter for a cylinder bore of $4\frac{3}{4}$ inches.

It may be seen from the drawing that the inlet rocker boxes and induction pipes are part of a common cast assembly. It is not made entirely clear, however, that removal of a complete inlet valve with its operating mechanism and seating is possible without disturbing the cylinder. This feature is one of several included to simplify maintenance. Having removed the inlet-valve assembly, the exhaust valve and seating may be inspected, and if need be, reground, also without removal of the cylinder. The cylinders and heads themselves are cast as units from a nickel chrome iron alloy.

Another unusual feature of the Cameron C4 is the positive supply of oil under pressure through the connecting rods to the piston. Cooling ribs are cast on the underside of the piston crown, and with the help of the oil supply these dissipate a good proportion of the heat from the combustion chamber.

The lubrication system is of the dry-sump type and one pressure and two scavenge pumps, built as a single unit, are located on the side of the crankcase.



A particular feature of the Cameron engine is the design of the inlet-valve assemblies, which are detachable as units together with their seatings. Note also the large-diameter opposed valves.

The crankcase, its top cover and the accessory drive casing at the rear are all magnesium castings. At the front end of the crankcase is the housing for a deep groove ball thrust bearing for the airscrew.

A Stromberg model PS5 injection carburettor is fitted, and dual ignition is provided by two coils. Fully screened harness will be fitted as soon as it can be supplied. The electric starter and generator are mounted centrally on the rear casing.

Gliding Records

BELOW are the latest figures for the different international gliding records with, alongside, the equivalent British figures. The latter may appear to be low in comparison, but, apart from any relative experience and opportunities involved, the adverse conditions in this country must also be remembered.

A record of 55 hr 52 min was set up on September 23rd/24th, 1943, in Germany by Ernst Jachtmann. In 1945 the F.A.I. decided to cancel all records set up during the war years.

	Official Performance *International*	*British*
Category I (Single Seaters)		
1. *Distance*		
U.S.S.R. Miss O. Klepikova, in Red Front 7, Moscow to Otradnoie (Stalingrad), July 6th, 1939.	749.203 km (465.6 mls)	
P.A. Wills in "Minimoa," Heston (Mddlx.) to St. Austell (Cornwall, on April 30th, 1938.		336 km (209 mls)
2. *Out-and-Return*		
U.S.S.R. Boris Kimelman in Red Front 7, Toula-Riajsk-Toula, July 23rd, 1939.	342.370 km (212.7 mls)	
Sqn. Ldr. W. B. Murray in "Rhönbussard," Ratcliffe Airfield and return, on April 7th, 1939. 34 miles each way.		109 km (68 mls)
3. *Goal Flight*		
U.S.S.R. P. Savtzov in Red Front 7, Toula to Mikhailovka, July 31st, 1939.	602.358 km (374.3 mls)	
P. A. Wills in Weihe, White Waltham (Berks), to Leiston (Suffolk), on July 27th, 1946.		182 km (113 mls)
4. *Height*		
Germany. E. Ziller in Kranich, Hirschberg, November 21st, 1938.	6,838 m (22,434 ft)	
P. A. Wills, in Weihe, at Long Mynd (Salop), on June 23rd, 1946.		4,647 m (15,247 ft)
5. *Duration*		
Germany. Kurt Schmidt in Grunau Baby at Korschenruh (East Prussia), August 3rd/4th, 1933.	36 hr 35 min	
Sub. Lt. A. N. Young in Falcon II at Long Mynd (Salop) on August 18th, 1938.		15 hr 47 min

	Official Performance *International*	*British*
Category II (Multi-seaters)		
1. *Distance*		
U.S.S.R. I. Kartachev, pilot, P. Savtzov, passenger, in Stakhanovetz from Moscow (Ismailovo) to Ouchinia (region of Tchernigov), July 17th, 1938.	619.748 km (385 miles)	
Lt. Cdr. (A) J. S. Sproule and Lt. (A) J. Suthers in Kranich from Peplow (Salop) to Owlswick (Bucks), on July 6th, 1946.		166 km (103 mls)
2. *Out-and-Return*		
U.S.S.R. I. Kartachev, pilot, V. Chechoulkine, passenger, in Stakhanovetz, Toula-Riajsk-Toula, July 23rd, 1939.	342.370 km (212.7 mls)	No award
3. *Goal Flight*		
U.S.S.R. K. Kartachev, pilot, A. Gorokhova, passenger, in Stakhanovetz, Moscow to Gorki, June 1st, 1939.	395,730 km (246 mls)	Instituted 1.4.39. No award
4. *Height*		
Spain. Luis Vicente Juez Gomez, pilot, Juan Jose Jurado Bembibre, passenger, in Kranich E-C 2-28, Huesca, September 25th, 1945.	5,723 m (18,776 ft)	
Sqn. Ldr. E. J. Furlong and Lt. (A) E. R. A. Johnson, R.N., in Kranich, at Peplow (Salop), on July 5th, 1946.		1,097 m (3,601 ft)
5. *Duration*		
Germany. August Bodecker and Karl Heinz Zander in Kranich, Rossitten, September 9th/11th, 1938.	50 hr 26 min	
Flt. Lt. W. B. Murray and J. S. Sproule in Falcon III at Dunstable (Beds.) on July 9th/10th, 1938.		22 hr 13 min 31 sec

AIRLINE PILOT

The Need for Standardized Qualifications : An Examination of the Present Requirements : Efficiency Essential for Prestige

A SUBJECT in the minds of many at the moment, pilots and air service operators alike, is that of the qualifications for employment in civil aviation. Operators wish to gather sufficient personnel to start flying the routes without expending undue time and effort in training, and ex-R.A.F. pilots, pitchforked suddenly into civil life with flying as their sole experience, are anxious to get to work as soon as possible.

These pilots find themselves faced with the necessity of passing the examinations for "B," 2nd Class N. and perhaps 1st Class N. licences. Some, the honest ones, realize that they may have more to learn—and get down to some study. But the majority, never by nature, they say, suited to academic pursuits, find the business of swotting up a "lot of rubbish" about soft iron magnetism and spherical triangles both wearisome and difficult. Why, they ask, having driven Lancasters through flak to Berlin (note the gong), must we go to school again before we can drive Vikings to Rome, or even Tudors to New York? Why indeed? I would like to try to answer that query, for there is obviously at present great pressure—understandable and even necessary pressure—towards the idea of relaxed standards though not enough serious consideration of the long-term effect of such relaxation.

The primary consideration must obviously be efficiency. The quality of those engaged in any enterprise is the key to its success. This is particularly true of British civil aviation, for we have repudiated the American "despatcher" technique and put our money on the captain. We are following, unconsciously perhaps (because aero-

The idea of the navigator as a kind of technician who produces courses to steer, as the steward produces coffee and biscuits, is one which the economics of commercial aviation will not support.

nautical prejudice is largely anti-nautical), the example of the mercantile marine, where the captain is the master of the vessel and of his fate in the open sea. Parallels with marine practice are not popular these days—perhaps because of a desire to break with old traditions, and the desire to model a modern system for a modern trade is healthy, but the sensible course is to review all that is valuable in the old methods and to adapt it to the new requirements. With all its alleged faults, marine practice collected the trade of the world and if British civil aviation has similar success we have nothing to fear.

Before discussing standards certain basic issues must be argued. It has been said that a person is not entitled to command others until and unless he can perform their individual functions himself. This may be unduly stringent, but the philosophy is surely sound. This conception of a commander's duties, of course, clearly determines his qualifications. Few will dispute the principle that the pilot, the man at the controls, should be the master, but the mere driving of an aircraft through the sky is only a part of the business of commercial aircraft operation. Taking-off and landing, especially during bad weather, are admittedly difficult and exacting tasks, but flight planning to suit the weather and intelligent navigation to suit economy and comfort—not to mention safety—demand an appreciation which is no less vital.

There is a deal of loose talk about pilots' and navigators' "unions." Surely, in civil aviation, the pure navigator will be forced out of business by his own weight. There will be a captain and a first officer—both of them pilots; safety demands that. The first officer will assist the captain with "vital action," at take-off and landing and in flight will navigate by whatever technique is appropriate to the conditions. This means that the first officer, who is the prospective captain, must be a skilled navigator, and that the way to the left-hand seat must lie via the chart table and the right-hand position. The R.A.F. idea of the navigator as a kind of technician who produces courses to steer, as the steward produces coffee and biscuits, is one which the economics of commercial aviation will not support. But in his absence his duties must be performed by a first officer of comparable skill. Any pressure to lower

New navigational techniques may demand new maps.

standards in order to enable pilots to fill his shoes must, in the long run, have the effect of lowering overall efficiency unless it can be clearly demonstrated that existing requirements are unreasonable. Pilots cannot have it both ways. Their right to the senior position can only be conceded if they are able adequately to replace those whose services they were previously only too glad to command. This was realized by Imperial Airways before the war, and will almost certainly be embodied by P.I.C.A.O. in the new international personnel standards. It is expected that existing navigators' licences will be compounded with transport pilots' licences to a degree compatible with their status.

Let us now examine the requirements in that light. The emphasis will be laid on the highest qualification for long-range work in large aircraft, because if that theme can be developed the rest should follow.

First, it is obvious that a commercial pilot should be prepared to demonstrate his flying ability. So far as this is concerned the present "B" licence flying tests are completely out of date. No commercial operator would dream of employing a pilot whose total flying experience was the bare "B" licence minimum. There is no test of ability in instrument flying—a ludicrous situation which is saved from being potentially dangerous only by the fact that general consent is so far ahead of officialdom. The R.A.F. have prepared a comprehensive scheme for instrument ratings; something of the sort must obviously follow for civil aviation—if only to line up with American practice.

The American C.A.A. have shown their opinion of British qualifications by refusing to allow British pilots to fly under Instrument Flight Rules in the States unless in possession of a U.S. instrument rating. This may be called discrimination—but unfortunate at all events. In the U.S.,

The present "B" licence flying tests are completely out of date.

of course, this rule and a lot more are based on that much-debated device, the Radio Range, which, whatever may be said about it, does at least simplify the problem of standards. Ability in instrument flying must be related to particular radio aids. Lack of a standard system makes the task of devising suitable tests difficult, but clearly a drastic revision of existing standards is long overdue. The precise definition of flying experience for particular licences will be a matter for debate, but the principle can be said to be established.

It can reasonably be demanded of the person in charge of a commercial vehicle that he should know enough about it for safe and efficient operation. The captain must be

AIRLINE PILOT

thoroughly familiar with the salient features of performance, loading, power, fuel, oil, brakes, de-icing, and so on. No one will seriously contest the view that, while the commander cannot be expected to know all about his aircraft, he must know a good deal. The science of "cruising control," for instance, is still in its infancy. It is related to other aspects of the art, such as meteorology, but a thorough appreciation of economic operation of power units will be essential.

Under "air transport knowledge" can be grouped those non-technical aspects of a commercial pilot's job which, though ill-assorted, are nevertheless important—such as legislation, regulations, procedures, hygiene, passenger comfort, care of freight, economic geography, politics, languages, signalling and those thousand-and-one things

Civil aviation, like everything else, has got to pay or go out of business.

which make up the *savoir-faire* of the complete commander. Before he can assume a responsible position in international aviation he must be quite clear on certain vital facts. Before he is asked to learn any more of it, the air captain should demand a thorough revision of civil air law. As it stands it is so full of holes as to be transparently ridiculous, and the legal status of an aircraft commander is simply conspicuous by its absence. No ship's master would dream of leaving port clothed in such a shabby legislative overcoat.

As far as mathematical knowledge is concerned, we enter the field of controversy. The subject has a disagreeable erudite tone which, rightly or wrongly, jars human susceptibilities. Lack of elementary mathematical training, however, is at the root of most objections to present navigational standards. Basic skill, with figures and with plane and spherical trigonometry, is the essential tool not only of the competent navigator but of anyone professing to understand the art of flying in general. It can be confidently asserted that a general raising of the standard of mathematical training, with particular emphasis on its utility, would have a beneficial effect which would extend far beyond the mere computation of angles and distances on the surface of the earth.

A proper appreciation of the uses and limitations of maps and charts demands at least an elementary knowledge of their methods of construction. A working knowledge of map production would also lead to more care in their use. New navigational techniques may demand new maps—Mercator's long reign may soon be challenged.

If captains of aircraft want good salaries then they must show that they are worth them.

And the only way in which pilots will get the maps they need is by knowing enough to be able to offer constructive criticism.

Tidal theory is one of those boring subjects which tend to infuriate the landlubber. Flying-boat captains must at least be able to predict tides from tabulated data. There might be a case for its inclusion as an "extra" in these cases, but, as the knowledge required is of such an elementary nature, and as the large transport aircraft of the future will probably be a flying boat, there is at least a case for its retention.

The pilot, alone in an empty cockpit with his controls, would not get very far. He is absolutely dependent on a variety—some would say a multiplicity—of instruments. Therefore, to master his profession, he must know a good deal about them—even more than he knows about the rest of his aircraft. Flight engineers will always be more numerous than instrument repairers and compass adjusters—and, in any event, the idea that crews have no time for compass swinging and, therefore, need to know little about it, is a dangerous doctrine. The only way to supervise the work of subordinates is to know at least the difference between a good job and a bad one. In this field of instrumentation there is great scope for development—especially with the advent of high-speed high-flying aircraft. The maintenance of a high standard of appreciation in the user must result in the continuous improvement of the product.

If a pure navigator is not to be carried, then the officer who conducts the navigation of the aircraft must show that he can do it satisfactorily. The advent of radar has rather fostered the idea that navigation is, like Latin, dead. Techniques will change, no doubt, but to say that classical methods can yet be discarded is just wishful thinking. The theory and practice of dead reckoning, radio, radar and astronomical navigation are still the essence of the commander's mental equipment. This is a particularly British asset. We have always excelled in finding our way about the world. Let us make full use of that facility in aviation, because he who follows the best route uses least fuel and carries the greatest payload.

So important is the study of the weather for civil pilots that their examination in that subject has always been conducted by senior officials of the Met. Office. That policy, which has paid an undoubted dividend in the past, looks like staying. Little more need be said except that the relation of meteorology to economic operation is of first importance—which is the core of civil flying. New horizons are here, too—pressure-pattern flying, high-altitude work, icing, turbulence and a host of problems to be overcome. There will be no relaxation of standards in Met.—in fact, quite the reverse. The men of the Met. Office know how difficult their job is, and they mean to take civil pilots along with them.

Civil air law . . . is so full of holes as to be transparently ridiculous. . . . No ship's master would dream of leaving port clothed in such a shabby legislative overcoat.

Closely associated with meteorology, the subject of flight-planning will become of greater importance—especially for long-range work. It will be more important for the charter pilot than for the air-line captain on a regular route, but the ability properly to evaluate the various factors for formulating decisions will be vital to success. Cruise control, when it starts to be applied, may shake us out of a lot of pre-conceived ideas, but intelligent planning must precede the application.

Finally, the captain and his crew must be fit—how fit, is another question. His livelihood depends upon the doctor. What about fatigue? This is a closed book to most, but, while not expecting the captain to know, we must be sure that the doctor really knows what is required of him.

If this necessarily brief review of the situation is balanced against existing standards it will be conceded that a definite tightening and raising, rather than any relaxation of the standards, is required. There may be something to be said for a reconsideration of the time factor in examinations—both in the speed expected of the candidate, and of spreading the examination over a longer period to facilitate preparation in these difficult days. But from the point of view of efficiency the case is clear.

There are, however, other points in this desire for relaxation. What will be the long-term effect on remuneration? Inevitably, the less skilled professional will command less pay. If captains of aircraft want good salaries then they must show that they are worth them; professional men are paid not so much for what they do as for what they know. Compared with his counterpart in other professions, the pilot seeking employment in civil aviation to-day would be hard put to it to justify the kind of salary he expects on the basis of his knowledge. He cannot, surely, expect to

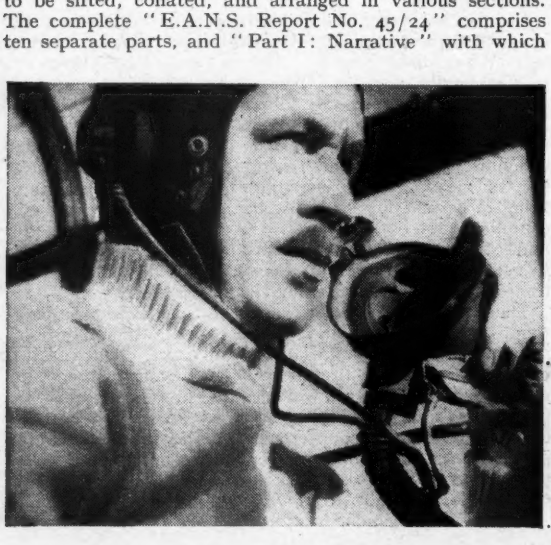
(*Concluded at foot of page* 631.)

POLAR REPORT

An Official Record of Aries' Arctic Flights has been Issued by E.A.N.S.

OF the various long-distance flights carried out by the Lancaster, *Aries*, from the Empire Air Navigation School at Shawbury, the most spectacular was the series to the geographical and magnetic North poles made in May of last year, and a full report on this Arctic adventure has been issued by Empire Air Navigation School. It may seem, at first thought, that this report has emerged a long time after, but the *Aries'* crew collected an enormous amount of information of various kinds, all of which had to be sifted, collated, and arranged in various sections. The complete "E.A.N.S. Report No. 45/24" comprises ten separate parts, and "Part I: Narrative" with which we are here chiefly concerned, runs to something like 12,000 words.

This narrative, here summarized, is a detailed account of what actually happened, as seen through the eyes of the aircraft's captain, during the 23,000-mile expedition, more than 10,000 miles of which was flown within the Arctic Circle. Although necessarily a factual account, it is brightened here and there by a humanizing touch of humour (as welcome as it is unusual in an official Service report). The following extract is a good example: "On reaching the Pole (geographical) an effort was made to speed up Phineas Fogg by completing an orbit of the Globe in 80 seconds. This involved crossing the Date Line twice in less than one-and-a-half minutes whilst proceeding in the same direction. Accountant Officer please note—does this affect allowances?"



THE SKIPPER, Wing Cdr. D. C. McKinley, D.F.C., A.F.C., often found the sun's rays, through the Perspex, decidedly warm.

Failure of "George"

The whole series of polar flights was completed without any major faults developing in either airframe or engines, but there were one or two minor troubles. Possibly the worst of these, from the pilot's point of view, was the complete failure of the auto-controls which meant that the last 60 hours' flying had to be completed under manual control. This caused "fatigue and a loss in aircraft speed." There were other discomforts, too, which had nothing to do with failure of equipment, and the worst of these, it seems, was the wearing of an oxygen mask for very long periods (18 hours at 15,000 ft).

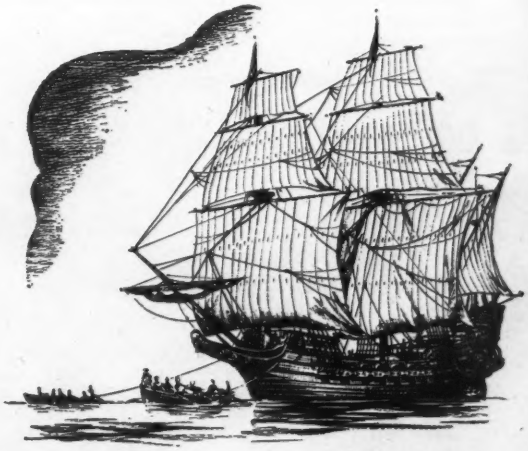
The constant glare of snow and ice had to be countered by the wearing of tinted glasses and there was only one comparatively brief relief from

AVRO TUDOR II

AVRO

Since Tudor times, Britain has led the world in transportation

In world transportation Britain has long been the acknowledged leader—little ships that in Tudor times circumnavigated the globe—steamships that carried the world's trade—railways, too, almost exclusively British in their development. Air transport follows naturally. Themselves pioneers in aviation, Avro well maintain Britain's lead. The Avro Tudor II, in which performance is soundly balanced with reliability, carries 40-60 passengers in luxury comfort over ranges up to 3,000 miles. Fully pressurised and air-conditioned, it has an economical cruising speed of 235 miles an hour and a top speed of well over 300.



A. V. ROE & CO. LTD., MANCHESTER, ENGLAND (Branch of Hawker Siddeley Aircraft Co. Ltd.)

POLAR REPORT

this in the whole of the total flying time of 109 hr 40 min. "Thousands of miles of apparently barren desolation were soul-destroying," observes the writer, "but the added discomfort of glasses perched on one's nose as well as the other impedimenta attached to one's head did not even tempers."

Actual intensity of cold did not worry the crew as much as inequality of temperature inside the aircraft. The effect of the sun's rays through the Perspex sometimes made the flight deck so hot as to necessitate flying in shirt sleeves, while towards the tail of the fuselage it would be extremely cold. Apart from the personal disadvantages, this complicated the food question, and the report admits that the really satisfactory solution to food and feeding was never discovered.

Most meals consisted of a selection of sandwiches, with coffee, tea, or fruit juices. But in the rear portions of the fuselage everything soon became solid (including the contents of the vacuum flasks!) while "up for'ard" in the warm section, food became dry and stale although some degree of warmth could be kept in the drinkables.

Nevertheless, the health of the entire crew gave no trouble and, except for an incident when somebody found in his rucksack a razorblade he wasn't looking for, the "ship's doctor" was left to pursue his operational tasks of recording physical and instrumental actions and reactions in peace.

Early Plans

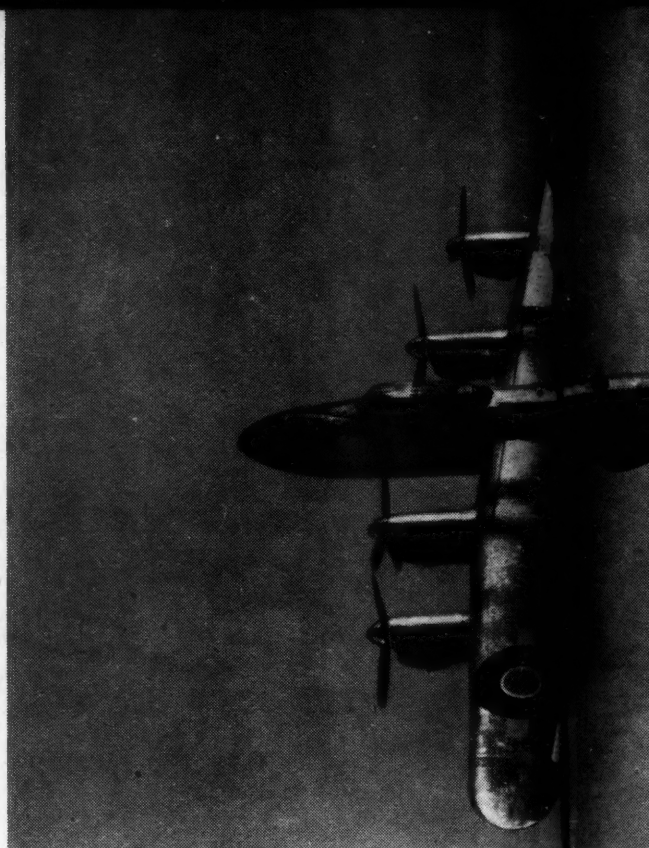
It goes without saying that an enormous amount of preparation precedes an aerial expedition of this unique character, and the planning in this case began the previous November. What probably is not so generally known is that the first seeds were actually sown in Canada in 1941 by Wing Cdr. K. C. Maclure, A.F.C., R.C.A.F., when he put forward certain ideas on polar air navigation. As there were no aircraft available at that time it was not until the autumn of 1942 that Wing Cdr. Maclure, whilst engaged on a specialist navigation course in England, advanced suggestions for practical tests to follow up his navigational ideas.

It was August, 1944, before the Air Ministry was able to lend a sympathetic ear to the project. Meanwhile, a lot of calculations had indicated that flights over the North geographical and magnetic Poles could be planned for January or February, 1945.

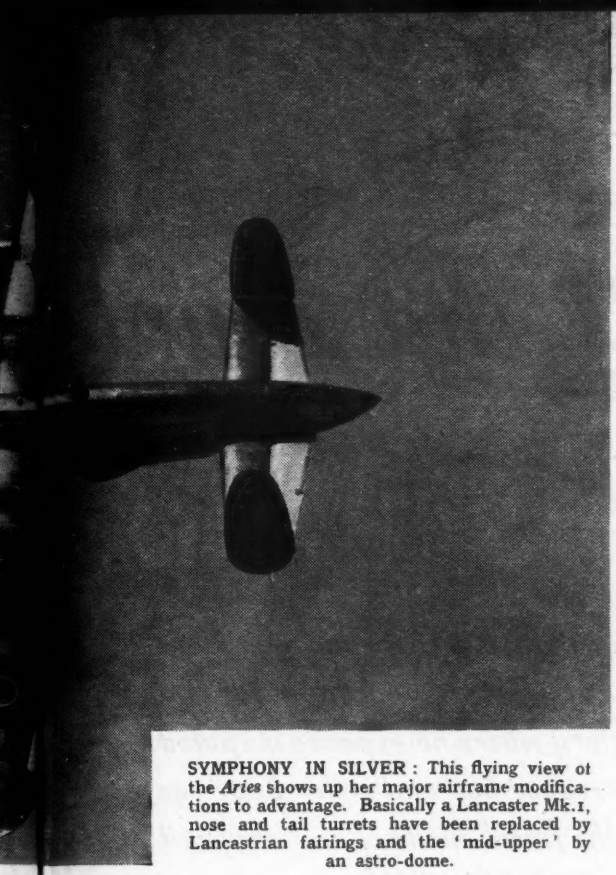
To the uninitiated it might seem curious to choose the winter for such an essentially chilly job, but there was very sound sense behind this. In high latitudes, astronomical navigation would be the only way of getting "fixes," while steering would be no mean problem and would call for observations on some heavenly body. That implied flying by night. Moreover, in the continuous daylight of the polar summer it would be necessary to carry out the flights while the Moon was visible from the North Pole, and when the resultant Sun and Moon position lines gave a cut of not less than 45 degrees, to ensure a safe standard of accuracy. As the Sun and Moon only take up the required positions for a few days at a time during each of the summer months, it was felt that the navigational problem would be considerably eased, if the flights were attempted in the starry winter skies. Added to this was the indication that the earlier months would provide more stable weather conditions in the upper atmosphere at least, though base conditions would probably be poor and the icing menace more acute for low-level operations.

However, it was found to be impossible to collect all the necessary data in time to stage the trip in January or February as planned; thus May was finally chosen as the last suitable month before the end of the summer when the combination of circumstances added up favourably. Even so, the need for accurate fixes in the vicinity of the geographical and magnetic Poles meant that these two flights had to be completed within a six-day period.

Finally, all preparations, including elaborate arrangements for the supply of the most accurate "met" information possible, were complete, and at 0900 hrs G.M.T. on May 10th the *Aries*, now gleaming silver and with Lancastrian nose and tail fairings instead of gun turrets, rose grandly into the air



GLACIERS AT SCORESBY: North of lat. 70, where compasses flatly contradict the Greenwich grid, thus making steering a very tricky business.



SYMPHONY IN SILVER: This flying view of the *Aries* shows up her major airframe modifications to advantage. Basically a Lancaster Mk.1, nose and tail turrets have been replaced by Lancastrian fairings and the 'mid-upper' by an astro-dome.

from Shawbury under the command of Wing Cdr. D. C. McKinley, D.F.C., A.F.C. Extra tankage had replaced her armament and with 3,944 gallons aboard she would have a range of approximately 4,800 nautical miles, though with her crew of eleven this meant an a.u.w. of just over 72,000 lb at take-off.

She made a brief call at Prestwick and then set out on a long run to Iceland, flying due west to a point almost in mid-Atlantic and then north to Reykjavik. This enabled the behaviour of all the installations to be checked and provided very useful fuel consumption figures.

It should be mentioned, before passing on to an account of the actual polar sorties and the non-stop return flight from Whitehorse to Shawbury, that the *Aries* was basically a standard Lancaster Mk 1 with Merlin XXIV engines and that in addition to the alterations mentioned above, the following "mods" had been made. The mid-upper gun turret had been replaced by an astro dome, a Lincoln undercarriage had been fitted to cope with the increased a.u.w., and the outer wing bracing and control surfaces strengthened. The extra tankage already referred to was accommodated within the fuselage and the bomb bay, and because space limitations necessitated installing many items of equipment in places which did not always make for an ideal C. of G. position, the overload fuel had to be used as a trimming medium by judicious transfers from these extra tanks.

Removal of all dope and paint from the outer surfaces of the aircraft and of the self-sealing compound from tank surfaces effected a useful saving in weight, while the polishing of the bare airframe surfaces improved performance by reducing skin friction

As the best period, from the navigational point of view, for the flights over the two Poles was from May 15th to 20th, the crew had a day or two at Reykjavik in which to go through the various drills once again, check equipment, verify the "met" facilities, and so on. Everything being ready by May 12th, it was decided to make a medium-length flight up the Greenland coast to about 75 deg N. to try out their navigational techniques and to look for food caches and emergency landing grounds. A high wind relieved the heavily laden *Aries* of any take-off problems, and the flight was quite uneventful. Nevertheless, it served to impress upon the navigator-pilot combination what a delicate business it was going to be to keep direction above 70 deg when they were flying north with the compasses registering almost due south by the "Greenwich grid."

The flight to the geographical North Pole was planned for May 15th with a 3 a.m. take-off, but bad weather caused a 24-hour postponement. It was decided that, with a take-off weight of over 72,000 lb, the *Aries* would find Meeks Field, about 25 miles from Reykjavik, a better departure point, so the aircraft was flown over there to take on the final fuel load in readiness for a 3 a.m. take-off next morning. This was fine for everyone except the navigators, who had to stay behind at Reykjavik to collect the latest possible "met" information, and then catch up on the ten-minute flight by means of a two-hour ride over anything-but-smooth Icelandic roads.

First Attempt Fails

The first full-load take-off from Meeks Field caused no undue anxiety, but the "met" forecast of favourable cloud conditions with tops not above 12,000ft and only slight icing proved to be too optimistic. After climbing slowly they ran into a considerable amount of middle-layer cloud, even before the island was cleared, which upset calculations quite a lot. It proved impossible to clear clouds with tops much nearer 17,000ft than the predicted 12,000, for the icing was bad enough completely to freeze up all the ice guards on the engines and to add an embarrassing poundage to the tail plane. The loss of power dropped speed by as much as 70 to 80 m.p.h., while any attempt to raise the ice-weighted tail from a crabbing position resulted in a hasty sink. However, it was still possible to maintain lateral stability, since icing on the main aerofoil section was nothing like so severe as on the tail—a difference which may have been caused by a local heating effect and water vapour from the exhaust gases passing over the tail—so every effort was made to outclimb and fly round the cloud formations. But after five hours the attempt had to be abandoned, and they flew back to Meeks Field.

It says much for the tenacious faith of aircrew in the "met" men that when, on regaining Meeks Field, they were told the troublesome weather was fast moving up on to the Greenland ice-cap, it was promptly decided to

FOURS HOURS OUT: Over this Greenland desolation, one engine had to be feathered while a faulty generator was 'flashed.'

It's Service that counts

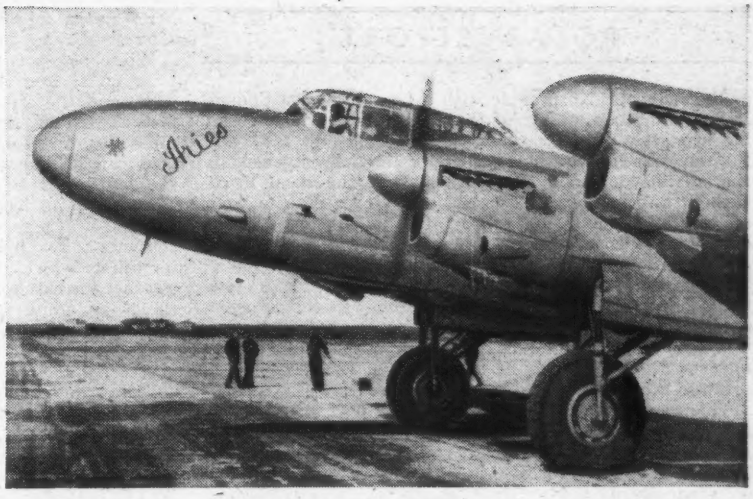
When you buy R&M bearings you know you are buying bearings made in a factory where no expense is spared to produce ball and roller bearings to the finest limits of accuracy and to give LIFE LONG service.

for SERVICE fit –

RANSOME & MARLES BEARING CO. LTD.
NEWARK ON TRENT ENGLAND

POLAR REPORT

refuel and depart again as rapidly as possible. Within a couple of hours the *Aries* once more heaved her 72,000 lb from the frosty surface of Meeks Field, but this time her skipper shaped a course well to eastwards to avoid any remaining cloud. Some dodging was necessary, particularly north of Jan Meyen, where cloud conditions were encountered which could not be outclimbed, but they made an early breakthrough with no serious loss in speed, and so, although the dodging had cost an hour, it was decided to press on. Some four and a half hours later they were able to make the first of a series of Sun/Moon fixes (Loran signals and radio bearings had served up till then) when they ran in on the cloud-free N.E. coastline of Greenland, and they then turned due North for the last stage to the Pole with the midnight sun rising dead ahead—a sight which duly impressed the astronomically minded aircrew!



CHOCKS AWAY!—With close on 4,000 gallons of fuel and a crew of 11, *Aries* had an all-up weight of over 72,000 lb. Here she is seen ready to take off from Reykjavik for Meeks Field from which the full-load take-offs were made on her Polar sorties.

A good deal of cloud was encountered in the Arctic Basin (to the vexation of the photographer), but in the vicinity of the North Pole itself they had an unrestricted view of the surface except for a small amount of low fog. Large leads of open water were seen, varying from half to about two miles long and some 200 yards in width, and over the entire Polar Basin there was much deep blue ice crystal haze which produced a very tiring glare.

They circled the Pole—completing an orbit of the globe in 80 seconds as already mentioned—and then flew back to Reykjavik without further incident. With the exception of a lone bird, possibly of the goose or duck family, they saw no sign of life even on the land of N.E. Greenland, and the lowest temperature recorded was −30 deg C.

On this flight it had been necessary to reduce everyone's oxygen supply because there was no oxygen-recharging plant at Meeks Field with which to top up the system after the first abortive sortie. The result was that nearing the journey's end the crew were all beginning to show signs of weariness. This was hardly surprising towards the end of a period of 30 hours, which had embraced some 28 hours in the air.

On May 18th the *Aries* again took off from Meeks Field, this time for the Boothia Peninsula and the magnetic North Pole. The flight level (15,000ft) was free from turbulence and ice, but there were only occasional and brief breaks in the cloud.

It was on approaching the Greenland coast that the first of a number of comparatively minor troubles befell them, for although the coastline was seen ahead on the H2S, a fuse blew about one minute's flight from the coast and prevented an actual crossing observation being recorded. Radio altimeter sounding was continued across the ice-cap, showing it to be consistently level at about 8,000ft above mean sea-level, and, after clearing the mountainous coastal belt, cloud cover gave way to clear skies, offering an unbroken view of the ice-cap and on to the Davis Straits.

DINNER IS SERVED! Temperature inequalities within the fuselage complicated the storage of food, but these crew-members, snapped during a mid-air meal of the inevitable sandwiches, appear to be fairly happy and comfortable, if slightly crowded.

Then about four hours out from Meeks Field the starboard generator began to falter and eventually failed completely. At the same time the port generator was observed to have a reversed polarity, so the engine was feathered while the generator was flashed, and then restarted. The normal charge was now being supplied by the port generator, but with the large additional load imposed by the special installations, the available voltage was hardly enough to ensure the proper working of the magnetic detection gear, so it would have been asking for trouble to have carried on towards the Boothia Peninsula; the only sensible alternative was a 1,000-mile diversion to Goose Bay.

This proved to be more than a wise precaution, for near Lake Melville both starboard engines developed vibration which showed a tendency to increase before the landing at Goose Bay. The trouble proved to be faulty plugs, and a complete change was made before carrying on.

They took off again at noon the next day, departure having been delayed a little so as to reach the region

POLAR REPORT

of the magnetic North Pole with a favourable positioning of Sun and Moon, and to get back to Montreal next morning just after dawn.

There was no wind when Skipper McKinley opened up the Merlins on Goose Bay airfield, but the *Aries* lifted without any anxious-making delay. A few minutes later an inspection panel in the port topside inboard leading edge blew open and tore away, the exposed hole adding a low-pitched hum to the general noise of flight.

Apart from meeting a narrow frontal belt about two hours out over Northern Labrador, the weather behaved itself. The "front" produced a little snow, causing a certain amount of icing, but there were no serious consequences this time, and the slight loss of speed was soon regained when the ice dried off in clear air.

This was probably the most interesting part of the whole expedition because it largely substantiated the Astronomer Royal's calculations as to the position of the magnetic North Pole. The general reliability of the compasses fell off gradually as the area of the Boothia Peninsula was approached, and periodical standard turns and weaves were performed to observe the tendency. The stabilized compasses seemed to function very well, even when over the charted position of the magnetic Pole, although, following a complete 360-deg turn, the Gyro Fluxgate compass took several minutes to regain directional stability. The several non-stabilized compasses of various magnetic moments either completed a series of revolutions or swung to east and remained there during a full orbit.

When over the Boothia Peninsula all compasses pointed roughly N.N.W. provided the aircraft was kept steady, and this being in agreement with the Astronomer Royal's calculations, they pressed on in that direction. Then, on reaching a point approximately 200 miles N.N.W. of the Pole's plotted position it was decided to turn for Montreal. Even at the turning point the compasses still seemed operative as such, and still pointed generally N.W., though by now they were far more sensitive to flight irregularities. But by the time the western shore of Hudson's Bay had been reached on the south-easterly course their reliability was rapidly returning.

Minor Troubles

It was on this stage of the flight that the auto-controls went "haywire" and every time they were engaged the "stick" was pushed violently against the dashboard, accompanied by full right aileron—an action which was sharply resented by *Aries* and her crew. The trouble proved to be due to a damaged plate case pressing on the actuating mechanism, but as the linkage had been distorted it was impossible to rectify it. This put "George" out of commission for the rest of the trip, so *Aries* had to be hand-flown all the way home.

One or two other little troubles, none serious, were put right on reaching Dorval Airfield; they included intermittent plug trouble, a broken aerial due to icing, and a blown exhaust stub.

Very complete arrangements were made for "met" forecasts to cover the rest of the trip from Dorval to Whitehorse (Alaska) and thence non-stop back to Shawbury on an "over the top" track with its apex at 78 degrees N, 90 degrees W. All departments and branches contacted gave first-class co-operation and nothing was too much trouble; the result was that the trip to Whitehorse was made with ease and the "met" forecast waiting for them at that far north-western outpost was described as "magnificent."

Official visits were paid to Headquarters R.C.A.F. and U.K. Air Liaison Mission at Ottawa before leaving for Whitehorse, and they put down at Rivers, *en route* for Edmonton, to discuss the flights with the R.C.A.F. Central Navigation School there. As Edmonton was the last major maintenance base on the route, a very complete check of the aircraft and its equipment was made here, and a take-off made in heavy thundery rain just after midday on May 24th.

Whitehorse was reached in clear skies after a mountain peak crawl from Watson Lake under a lowering cloud-base, and the airfield, set on a plateau several hundred feet above the surrounding country, was visible many miles distant. Landing on, and taking off from this airfield can be likened, to some extent, to operating from a gigantic aircraft carrier with a flight deck more than 2,000 yards in length. Here the *Aries* was refuelled for the non-stop homeward stage, and it took more than the contents of two huge American refuelling trucks to satisfy its thirst, which caused quite a lot of comment. The weather forecast for the morrow was favourable, so everything—including another plug change—was completed overnight.

Home, Non-Stop

Before the shadows of mountain peaks cast by the rising sun had cleared the airfield, the *Aries* was wheeled out of her hangar for a final detailed inspection. The take-off at slightly more than 72,000 lb a.u.w. and at 3,000ft above mean sea-level made them remember the advantage of sitting on a plateau, but in actual fact the aircraft unstuck at 130 m.p.h., I.A.S., in just under 1,200 yards without using full power. She climbed to 10,000ft in 15 min and the 3,710-mile homeward flight had begun.

Out over the endless wilderness of snow and ice they encountered icing conditions again, with attendant loss of power and speed, but they broke out into the clear about 80 miles west of the Mackenzie River and clear weather conditions blessed them for almost the entire remainder of the route. As they approached the estimated position of the magnetic North Pole, the behaviour of their compasses served to confirm the previous observations and conformed far more closely with the predictions of the Astronomer Royal than with the magnetic values given on the navigation charts. It indicated a position roughly 240 nautical miles N.N.W. of the most northerly point reached on the flight from Goose Bay a few days previously, namely 77 degrees 30 min N, 105 degrees W. The calculations from the Royal Observatory had placed the mean position of the dip-pole at 76 degrees N, 102 degrees W., which was reasonably close agreement.

By the time Smith Sound was reached the compasses had settled down again and in due course a landfall was made on the north cost of Iceland. Unfortunately, however, the high-scale radar altimeter had failed earlier in the flight and prevented a second sounding crossing the Greenland ice-cap. Owing to the presence of cloud in varying amounts below the aircraft, and in the absence of reasonable information about high ground, it was not thought wise to reduce altitude for a low-level sounding. Inland from Scoresby Sound, however, visibility allowed an unobstructed view of the whole horizon, and high spots queried on the chart as possibly extending to 20,000ft were apparently non-existent.

Between Iceland and the U.K. they experienced the first radio black-out which reduced contact to one or two of the more powerful stations, but conditions returned to normal before crossing the North Channel. The rest of the 18½-hour flight was uneventful, a short spell of bad weather with moderate icing and the enthusiastic welcome at Shawbury being the only two remaining experiences.

Some final observations on the performance of the *Aries* are worthy of note. Engine performance for the most part was extremely good although icing interfered with it at times. Overall petrol consumption worked out at about 50 ton-miles per gallon or just over 6 ton-miles per pint, while the figure for oil was about 1.2 pints per engine per hour, or about 1,800 ton-miles per pint.

Incidentally, icing conditions had no effect on the oil system at any stage of the operation.

There was no instance of irregular cooling, even though no attempt had been made to provide shuttered coolers, earlier experience having shown them to be unnecessary

(*Concluded on p.* 624.)

RADIO AT PARIS

British Firms Well Represented : High Standard of Equipment

By BASIL R. CLARKE, A.M.Brit.I.R.E.

BRITISH radio manufacturers were present at Paris in good strength, although the proportion of British exhibitors was not quite so great as in the case of the purely aeronautical products.

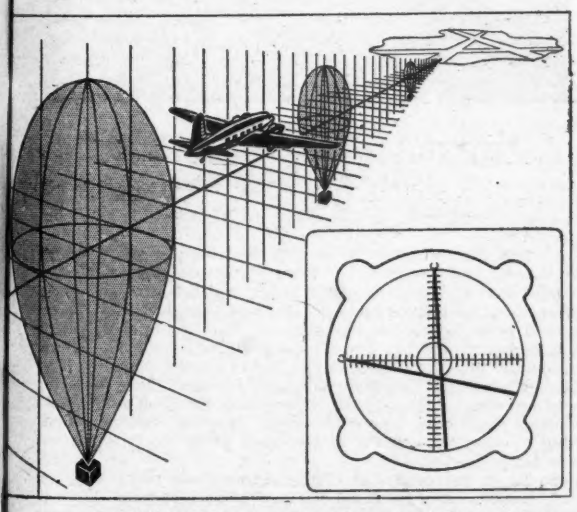
Most of the names well known in the industry were billed in the Salon, and, in pleasing contrast to the somewhat insular British way, French-speaking representatives were present at almost every stand—an indication of the efficiency and organization in the present export drive.

A new inter-communication system produced by Ultra Electric, Ltd., was much the same as that shown recently at Radlett but with the improvement that volume controls were fitted to all channels, whereas previously there was one control for the lot. Accessibility for servicing purposes has been enormously improved, and this apparatus is now being fitted to quite a number of new aircraft. The company also showed their electrically controlled actuators.

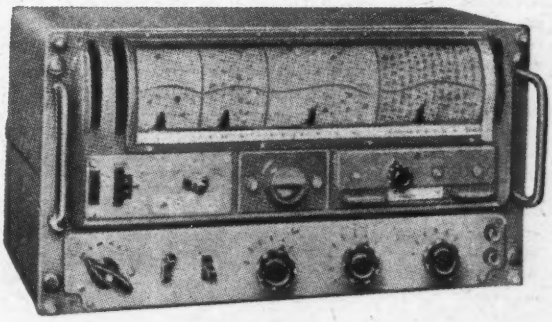
The Marconi company presented a convincing model of their A.B.A.S. blind-approach guide which was developed by Pye, Ltd., but is being marketed by the Marconi Group. It employs a V.H.F. beam with the usual marker beacons, and it is claimed that an aircraft can be flown safely down the prescribed glide path to within a few feet of the runway in zero visibility. Some notes on this equipment appeared in *Flight* of October 10th.

The Rg 44 communication receiver was also on view, and while employing all the usual refinements in such receivers it has the advantage that the scale length is effectively of the order of 30ft, thus providing very accurate adjustment of frequency. A further improvement is the incorporation of a wave meter by which the dial accuracy can be checked at will. This, in practice, means that the receiver can be tuned with certainty to the frequency of a transmitter which is not at that time working but from which signals are awaited. The frequency range is from 2-20 Mc/s.

The new lightweight racking system for airborne equipment has an important place on their stand, and this versatile system of mounting is now in full production. It should do much to simplify the designers' problems in the location of the radio "black boxes."

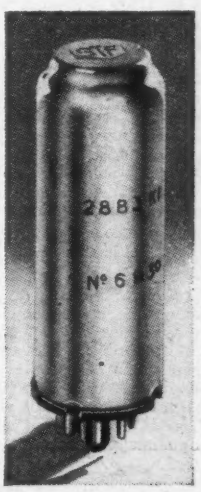


A graphic illustration of the Marconi A.B.A.S. blind-approach guide, a model of which was shown in the *Grand Palais*.



The Marconi high-discrimination communication receiver Rg44. It has a spiral frequency-calibrated tuning scale.

Standard Telephones and Cables, Ltd., showed apparatus of the M.F., H.F. and V.H.F. types for both ground and airborne needs. The STR 11/13, which is an H.F./M.F. communication and DF. equipment, shows a considerable advance in technique and, without the connecting cables, weighs only 85 lb in all. The receiver sensitivity is high, and a good signal-to-noise ratio is obtainable, thus improving reception conditions. The frequency ranges are 320-520 kc/s in six crystal-controlled spot-frequencies for the M.F. transmitter and 2.0-9.1 Mc/s in six crystal-controlled spot-frequencies for the H.F. transmitter. The receiver coverage is from 150-1,500 kc/s on the medium range and from 2-11 Mc/s for the high-frequency range. The total power consumption at 26 volts D.C. is 350 watts for the transmitter and 75 watts for the receiver.



The S.F.T. plug-in quartz crystal.

This firm also showed their new V.H.F. cathode-ray tube direction finder, which has been developed largely for the Admiralty for use in aircraft carriers. No details can be released at present. It can be said, however, that the workmanship is of the high standard to be expected from this manufacturing concern.

Amongst the foreign stands the *Société Française des Télécommunications* had a very fine display of Piezoelectric Quartz crystals of the "plug-in" type and covering all frequency ranges.

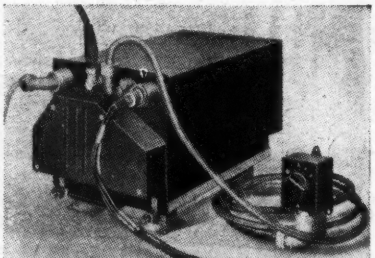
Sadir Carpentier showed four pieces of apparatus, including the V.H.F. telephony transmitter-receiver No. ER 373, which operates in the band from 108 to 132 Mc/s. The power consumption of approximately 3 watts gives a range of about 60 miles from an aircraft flying at 3,000ft. A D.F. equipment, No. G353, also operating at V.H.F., was shown on which it is claimed that a bearing accuracy of ±1 per cent is obtainable.

An airfield crystal-controlled transmitter, No. E 332, and

RADIO AT PARIS

a receiver, No. R 297, both operating from 108 to 156 Mc/s were on show. The transmitter has an output of 100 watts and a range of up to 180 miles. This apparatus is extremely well made and appears capable of standing up to hard work.

The official exhibit by the French Air Ministry included a display of the equipment used in the control of commercial flying in France. Samples of all types of communication equipment were shown, including teleprinters for ground-to-ground communication and both radar and ground-control radio systems were on view. A model of a beam-approach system using cathode-ray DF was also shown but was not apparently in working order.



The Standard V.H.F. transmitter/receiver S.T.R.9. It has an output power of 4 watts and weighs 22 lb.

La Laboratoire Radio Electrique showed a large selection of valves, a ground transmitter and an airborne inter-com. outfit.

Jaeger Aviation demonstrated the accessibility for servicing of two equipments, the transmitter TA2Y and the receiver RA1X. The receiver covers a range of from 150 K/cs to 1,525 K/cs and from 2.5 to 20.5 M/cs. Both these equipments are for airborne use and appeared technically good, but were constructed on rather a massive scale for this purpose; the solid construction may, nevertheless, pay dividends in reliability.

Weighing only 11 lb, the Airborne M.F./H.F. receiver is just 4in wide.

On view an the stand of *Applications Industrielles Radioélectriques* was a very fine display of multi-contact plugs and sockets of every conceivable type for use in connection with wiring harness. The standard of construction was very high and it seems that reliability of contact has been assured, which is certainly not always the case with this type of apparatus. The same company showed a public-address amplifier for airport use which, while not employing any specifically new principles, is apparently an extremely reliable piece of apparatus and is claimed to give very good speech reproduction. A playing table for gramophone reproduction is incorporated.

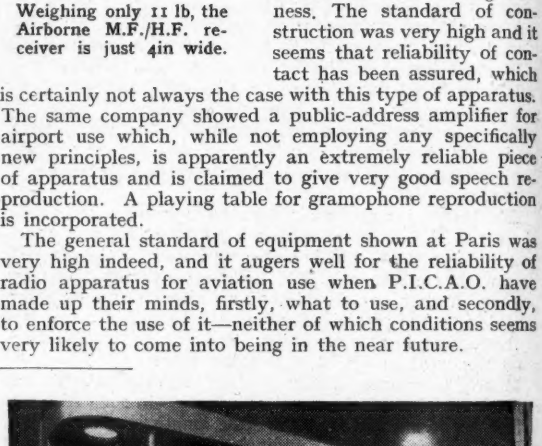
The general standard of equipment shown at Paris was very high indeed, and it augers well for the reliability of radio apparatus for aviation use when P.I.C.A.O. have made up their minds, firstly, what to use, and secondly, to enforce the use of it—neither of which conditions seems very likely to come into being in the near future.

MESSIER LICENCE AGREEMENTS

AERONAUTICAL AND MECHANICAL INVESTMENTS, LTD., Messier, S.A., and Electro-Hydraulics (Messier), Ltd., formerly known as Messier Aircraft Equipment, Ltd., announce that the licence agreements between them have been cancelled by mutual consent. Electro-Hydraulics (Messier), Ltd., are retaining on a non-exclusive basis, and for aeronautical application only, the use of the following patents: 412191, 425207, 456863, 468196, 451901, 481762, 527225, 452324, 492751 and 539807. They are also retaining limited non-exclusive licence rights in respect of Nos. 412756 and 565000. Steps are being taken to delete the word "Messier" from their title, and the Messier Eagle will be placed at the disposal of Aeronautical and Mechanical Investments, Ltd.

TEST PILOT TRAINING

IN next week's issue we hope to be giving an account of the work of the Empire Test Pilots' School at Cranfield. This School, which was established in 1943 at Boscombe Down, and moved to new quarters at Cranfield, near Bedford, late last year, is one of the more important developments in specialized pilot training. Particularly so, since the test pilot of the new generation of aircraft will need more specialized and technical knowledge than ever before if development work is to proceed without unnecessary wastage of time, material and even life. The E.T.P.S. is, in short, a vital link in the chain of aerodynamic progress.



IN THE GALLERY: The Dowty stand at the Paris Show which had as its main exhibit a working example of the Avro Tudor undercarriage.

POLAR REPORT

(*Concluded from page 622*)

with the Merlin XXIV installation. The operating oil temperature never fell below about 40 degrees C, so it was not felt that the necessary additional fitting was warranted.

Although operating at an overload of some 8,000lb above the original specifications, full power was never required from the engines—not even at take-off. A maximum of 3,000 r.p.m and 16 lb boost was used on one occasion, namely when taking off from Goose Bay during nil wind conditions, but even then the *Aries* flew herself off at the very safe I.A.S. of 135 m.p.h. and settled down to an easy climb at 170 m.p.h., I.A.S. About 22 degrees of flap was used for heavy take-offs, and up to about 7,000ft the climb seemed to be helped by some 3 to 5 degrees flap until performance was improved by the lower temperatures above that altitude. General operating range was about 2,250-1,900 r.p.m.; lower revolutions had been planned, but some compromise was necessary to offset loading and icing problems.

In fact the technique to be used had been agreed upon as high boost and low revs, but a certain amount of trouble was experienced with leading of the plugs, which became apparent after about 40 hours running. This was thought to have been caused by a slightly too rich mixture, resulting in a deposit of soft carbon which has a sympathetic affinity for lead, but as automatic mixture controls were fitted, nothing positive could be done about it. No attempt was made to alter the carburettor settings, since, in the absence of necessary checking equipment, matters might have been made worse. However, fairly frequent plug changes covered the matter and, at its worst, vibration was never excessive.

So far as the behaviour of the airframe was concerned, the only trouble was a fit of tail shimmying when taxying. This is described as "a dangerous and unpleasant vice in the otherwise faultless performance of the aircraft" but it was cured by increasing the pressures in the tailwheel tyre and oleo.

Power Installations

Future Aircraft Requirements Classified : Possible Propulsion Arrangements

By F. M. OWNER, M.Sc., F.R.Ae.S., M.S.A.E.

IN a most comprehensive paper delivered before the Royal Aeronautical Society on November 14th, Mr. F. M. Owner, who is in charge of Bristol turbine development, outlined the various types of aircraft likely to be produced during the next five to ten years, and went on to discuss in detail the power units which will be required and their particular characteristics. There follows a summary of the main points made in his lecture.

"It has been a platitude for some time past to say that aircraft and engine design are mutually interdependent. Now it is more than a platitude, it is a fact, and one to which we have not yet grown accustomed. Pursued to its logical conclusion the implication is that the new aircraft and its means of propulsion should originate in the same brain and be designed, developed and manufactured under the guidance of that brain. Not for years have there been so many exciting possibilities of advance both in aerodynamics, thermodynamics and on the mechanical side, but practical experience is as yet available only to a very limited extent indeed."

The main headings of the paper were: Classification of aircraft requirements. Classification of power plants. Possible power installations. Installation requirements. General trend of developments. Conclusions on engineering problems.

Under the first of these headings, and concerning the subheading "military aircraft," the lecturer stated: "It may be that the development of rocket-propelled pilotless missiles together with atomic power will entirely change the character of air power as we know it to-day, but such development naturally takes time, and in the interim the development of military aircraft will not stand still. Military aircraft must be designed not so much from the point of view of safety and economy, but for the overriding condition of high performance."

Mr. Owner went on to say that "While it is inappropriate for an engine designer to attempt to foretell the time when the sonic barrier will be crossed, it may very well be several years before this is achieved experimentally, and considerably longer before it is a practical possibility. It is, therefore, reasonable to assume that the design of military fighters will tend to stabilize itself for a time. Meanwhile, the engine designer can supply his aircraft colleague with more power than the latter can possibly use. The question may arise, however, as to whether the limit of fighter development has nearly been reached because of the limit of the endurance of the human body. . . . It may be concluded that pilot control of an interceptor missile is approaching the limit of its utility, and may well have to be superseded by robot control from a distance.

'The intercepter is not the only possible type of fighter. . . . It seems, in fact, likely that an escort fighter will be needed to accompany the future bomber on long-range missions, if not, indeed to supplant it by taking over the remote control of long-range guided missiles. For either duty, emphasis will need to be given to the reduction of drag and specific consumption in the power installations rather than to the attaining of the maximum possible specific output."

Of future bomber aircraft, and with reference to the atomic bomb, the lecturer said: "The trend of development may well be to the design of an extremely fast, but relatively small aircraft carrying this new type of weapon. Clearly the power plant required for the new vintage of bombers will need the best possible fuel consumption consistent with reasonable bulk (and therefore drag); power plant weight is likely to be a small fraction of the fuel weight. A change of emphasis in the power plant installation design features is again indicated together with the incorporation of measures designed to reduce the overall drag of the aircraft."

Commenting on the rôle of air transport in the last war, Mr. Owner went on to say: "The extreme mobility afforded by air transport is so valuable and in any case the time gained is so large that emphasis on extreme speed seems unlikely. The aircraft used will therefore be long-range transports of either low or medium speeds." ". . . It seems certain that in this field airscrews will be the chief means of propulsion and that they will be driven by piston engines and by airscrew turbines in cases where the speed requirement warrants their use."

He next mentioned a slow type of reconnaissance aircraft for use at sea where duration rather than range or speed might be the criterion. "For this application the piston engine, either in its present form or compounded may be expected to survive."

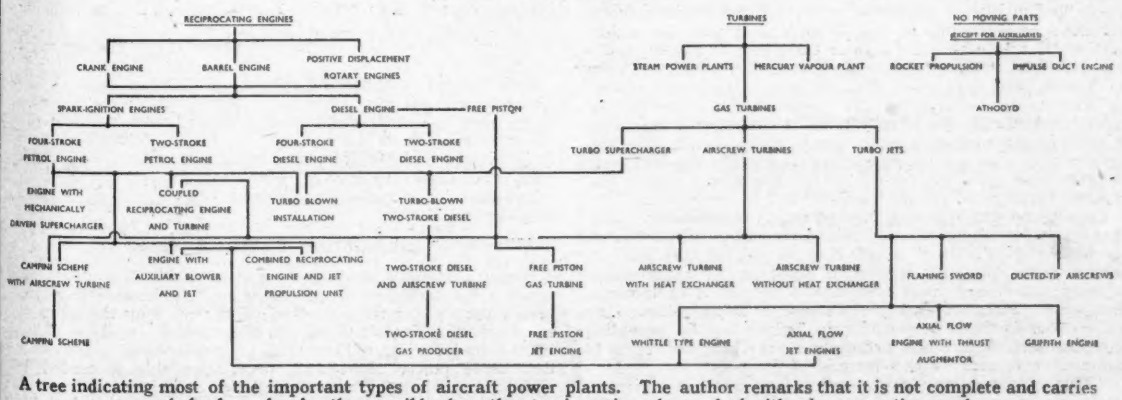
The lecturer concluded his observations on military aircraft by stating that the elementary trainer must remain as simple as possible and no important changes in present-day types seemed warranted. The airscrew turbine might well serve as an intermediary between the elementary trainer and the very-high-speed jet engined machine.

Civil Aircraft

Mr. Owner stated that undoubtedly the most vital requirement under this heading must be safety in operation, and the next important qualification was economy of operation with low initial cost.

"It had already been postulated that for economic high-speed long-range services, high altitude flight becomes essential, but we have had more high-flown talk than high-flown aircraft so far. Some time is likely to elapse before operational altitudes for civil airlines will attain the 35-40,000ft level, and in

AIRCRAFT PROPULSION SCHEMES



A tree indicating most of the important types of aircraft power plants. The author remarks that it is not complete and carries much dead wood. Another possible class, the atomic engines, he marked with a large question mark.

POWER INSTALLATIONS

many instances the use of such altitudes will not be justifiable."

Of long-range civil types he said: "Since the still-air range requirement for transatlantic operation is of the order of 5,000 miles, the weight of fuel required is very high indeed, something like one-third of the all-up weight." "... so it is abundantly clear that the prime requirement for the power plant is low fuel consumption, which consideration is so important as to outweigh almost every other. For this reason alone a limit is placed on the cruising speed attainable. . . ."

He continued that the use of airscrews was indicated, "and the high powers required are a powerful inducement in the direction of gas turbines which are more compact and therefore more easily buried within the wing. Complete enclosure of the power plants puts a limit on the size and power of each individual unit, and it will therefore probably be necessary on this score to use more engines, a tendency which would be desirable in any case in a type of aircraft where the highest degree of reliability is so necessary. The turbine version of the Bristol 167 will retain the coupled arrangement used in the piston-engine version. The advent of jet propulsion in this type of aircraft must await a considerable reduction in specific fuel consumption and aircraft drag at the necessarily high cruising speeds involved.

Civil Aviation Mainstay

"The medium-range aircraft can be justifiably regarded as the mainstay of civil aviation, and the major class will undoubtedly be required for journeys where ranges of the order of 800 to 1,000 miles will be encountered. Here the comfort of the passenger becomes a primary consideration, and pressurization may well be considered worth while. As regards speed, there is still no necessity for exceeding 400 m.p.h. in that incidental travelling, and waiting at the termini will still form an appreciable proportion of the total. The most suitable power installation appears to be the airscrew turbine with improved fuel consumption.

"Another class of aircraft which may be required, although probably not to such a large extent as the previous type, is the air liner covering ranges up to 2,000 miles. From the economical standpoint it would probably pay to fly at altitudes of the order of 40,000ft, and pressurized cabins will be essential. The most suitable power plant for this type of aircraft will be either the airscrew-turbine or the jet engine. The ultimate choice can only be determined by a balance sheet, which in turn can probably only be drawn up from actual experience. An excellent forecast, however, is to be found in Mr. Clarkson's paper at the Gas Turbine Discussions in March. The turbine consumption figures estimated by Mr. Clarkson have yet, however, to be attained in service."

Referring to special aircraft types for individual routes such as the 500-mile London to Paris run, the lecturer said that the requirements were reliability and economy rather than high performance. "Airscrew power plants are, therefore, likely to be the choice in this field. The low weight of the simpler type of airscrew turbine may more than counterbalance the increased fuel consumption for the short range, thus giving an increase in available payload in addition to improving the aircraft utilization.

"Freight aircraft can be sub-divided into two main classes: (a) The transoceanic large freighter travelling at moderately high speeds and altitudes, unpressurized except for the crew compartment and landing at major airports. (b) The transcontinental medium-sized freighter travelling relatively slowly and at low altitudes, capable of landing and taking off from small airfields.

"The essential features of all freight carriers must be low capital and running costs, robustness of design, and capability of sustaining operation without undue maintenance. The airscrew-engine combination again appears to offer the best form of propulsion, with piston engines for the slower classes and airscrew turbines for the medium speeds."

Turning to fundamental aerodynamic considerations, Mr. Owner said: "It is indisputable that a very great demand exists for higher speed. It is noteworthy in this respect that to achieve these speeds no important aerodynamic improvement is being introduced apart from the development of laminar-flow wings, and increased performance is being achieved by the obvious methods of cleaning-up designs and by providing more thrust. We are now definitely approaching the region of diminishing returns by this method of progress.

"The advent of the swept-back wing, while it offers an attractive means of postponing to higher Mach numbers the occurrence of prohibitive compressibility losses, introduces a new state of control problems, and does nothing to reduce the normal penalty of increased speed irrespective of compressibility effects.

"Laminar-flow wings offer an attractive means of reducing drag, but their applications would seem to be very much limited by their great susceptibility to the most minute surface irregularities." ". . . the old idea of boundary layer control seems to offer the most promising approach. It is possible either to draw away a turbulent boundary layer or to accelerate it."

Classification of Power Plants

Overlooking the rocket engine for the time being, the lecturer reviewed fundamental characteristics of power plants and said that the tree (see diagram) mentioned most of the important types of engines, but was not complete. It also carried much dead wood which was included for its historical associations. The types of engine with which he was primarily concerned could be classified as: piston engine; airscrew turbine; jet turbine.

Of piston engines he said: "The main assets of the piston engine are its long background of development; flexibility of operation over a wide range of conditions; and high thermal efficiency." ". . . progress in development has become increasingly difficult and is in many cases incommensurate with the effort expended. This is particularly apparent in the expansion of the piston engine to any high powers and very high altitudes. The same tendency is apparent in the increasing difficulties surrounding the design of the cooling systems, and the other evils of vibration and noise have by no means been banished.

"Nevertheless, the ability of the piston engine to retain its efficiency at low speeds and altitudes where the turbine cannot yet compete is indicative of the rôles that it will continue to fulfil for a very considerable time to come. It is clear, however, that we have reached the end of the process of supercharging piston engines to higher altitudes. It would seem advisable to investigate other uses (than larger jet effect) for the exhaust energy such as assisted cooling, provided this can be done with a practicable installation from a noise and safety point of view."

Airscrew-turbine

The gas turbine as a prime mover has hitherto been discussed mainly in connection with jet propulsion. Assuming that the general principles are already recognized, there appear to be two main avenues of improving the fuel consumption: (a) by the use of heat exchangers; (b) by the use of high expansion ratios. The Bristol Aeroplane Company is following both these lines of development.

"The absence of vibration which is a characteristic of the turbine engine has a large influence on the design of airscrews. These conditions have already been proved at Bristol. . . . the results obtained show that an immediate and appreciable reduction in airscrew weight is possible. . . . it appears not unreasonable to expect efficiencies well over 80 per cent at speeds of the order of 500 m.p.h.

"The gas turbine is essentially a fairly high-altitude power plant and cannot be so economically employed at lower altitudes.

Jet Turbines

"In its own particular field the jet engine has not as yet been given a square deal in so much as the aircraft designer has not been able to produce a machine capable of utilizing the advantages of this form of power plant to the full. Efforts towards improving the thermal efficiency of jet engines must be made."

Referring to compounded engines, Mr. Owner said: "The idea has been put forward in many forms, mainly on the score of its very low fuel consumption. While this is undoubtedly an attraction, it is feared that an engine combining both reciprocating and turbine prime movers may very well suffer from the disadvantages of both without many of their advantages. A singular disadvantage of such an engine is its large bulk and weight."

Installation Requirements

Under this main heading the speaker said: "A great step forward was achieved in the year or two immediately preceding the war by the concerted efforts made by the industry to standardize installations, an effort which, while it failed in the major aim, did succeed in establishing the quickly detachable power plant and more than this succeeded in making the whole industry installation-conscious.

"The prime essential of a successful power plant installa-

POWER INSTALLATIONS

tion varies somewhat in the different aircraft classifications. The following conditions must be met: (a) interchangeability as a unit; (b) good component accessibility; (c) low maintenance requirements; (d) design for economical performance; (e) good relationship to wings and fuselage."

As an example it was stated that in a military high-performance aircraft emphasis is obviously placed on low body and cowling drag at some expense in the way of accessibility and interchangeability. Continuing, the lecturer said: "Although the piston engine has, perhaps, reached its zenith . . . with regard to its development as a power plant there are still certain problems which have not been satisfactorily solved and which have been inherited by the gas turbine engineer. These are the problems of fire risk, anti-icing and air filtration, and it is felt that an extra attribute of the good power plant should be inserted at the beginning of this section, namely, safety.

"No effective and foolproof system has yet been devised to prevent carburettor (or injector) icing. Much work has been done both in the use of heat taken directly from the piston-engine exhaust and by the use of a heat exchanger applied to the engine exhaust. Neither method has been successful because of practical difficulties such as high back pressure in the exhaust system, insufficient heat and mechanical failure of piping and ducting. The first really practicable proposition has been the development of combustion heaters which, although they have not yet been thoroughly proved in operational service, are sufficiently reliable as units to be scheduled for use on the prototype Bristol 167 for which the heat required for the whole aircraft amounts to 3,000,000 B.Th.Us per hour, three-sevenths of which is for the main wing de-icing.

"The gas turbine engine offers a new source of heat for this purpose, in that the use of a muff or intensifier system on the jet pipe would give all the heat required. It is intended, moreover, to use this heat for anti-icing purposes on and in the engine, and various experiments are being made in an endeavour to introduce the heat uniformly into the compressor system.

"The term anti-icing is used deliberately in preference to de-icing because it is felt that every effort should be made towards the prevention of ice formation rather than the removal of ice after it is once formed."

The lecturer said that fire prevention and control is now much more fully understood. "It cannot be too strongly emphasized, particularly in the commercial field, that where other installation problems interfere with the fire control arrangements the former must suffer.

"The use of kerosene as a fuel introduces a new set of fire prevention problems despite the obvious advantages of kerosene over petrol. Its tendency to creep from what appears to be tight joints and the problem of explosive vapours forming in fuel tanks will need their own safety measures.

"The problem of air filtration in the piston engine is large, and in the gas turbine field is greater. The air mass-flow is so great that no filter material within any reasonable area could cope with it without considerable pressure drop. . . . the only effective way of dealing with this is to make a turbine engine 'eat sand and like it,' and in this regard it is understood that a centrifugal jet engine has performed quite happily under desert conditions with little apparent deterioration due to the sand erosion.

"The axial compressor type of turbine will need special attention, as there are two problems to be dealt with, namely, that of blade erosion and of loss in performance due to blade fouling. The first of these problems may be met by using hard blades, say, steel or bronze, instead of dural, and the second by preventing oil leaking into the compressor."

Turning to starting problems, Mr. Owner mentioned electric, cartridge, two-stroke motor and inertia systems for starting piston engines. He then said: "The turbine engine starting system is still far from satisfactorily developed. Essential requirements are the ability to accelerate the compressor system smoothly by starter motor alone.

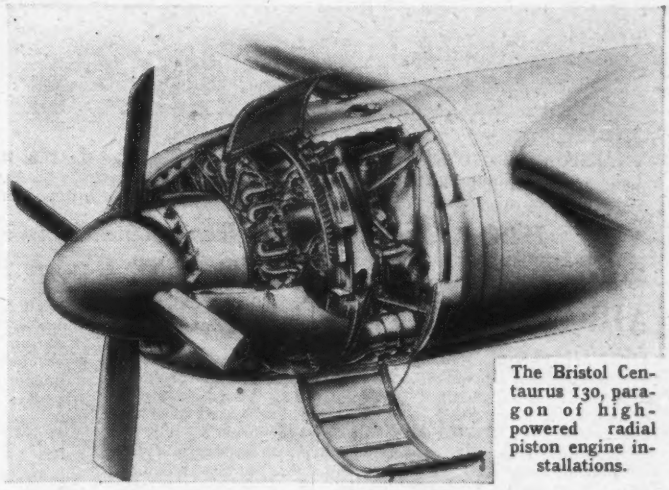
"In the case of airscrew turbines, with the exception of the Bristol Theseus, it is necessary also to accelerate the airscrew as it is coupled directly to the compressor system. The Bristol Theseus engine here shows a decided advantage in that the free power turbine system employed relieves the starter of the necessity of turning the airscrew.

"In large aircraft such as the Bristol type 167 the miniature power plant carried for general services makes electric starting almost a *sine qua non*.

"It is hoped that a slow-burning cartridge system employing a compact high-speed turbine as the power transmitter will eventually be adopted. This system only receives this support because the electric system is inadequate for military needs. The cartridge system should, therefore, be used on commercial aircraft as well to avoid duplication of effort."

Engine cowlings were next discussed, and Mr. Owner said that they would "present no new problems so far as can be seen." He then commented on the happy absence of cooling gills, radiator installations, cylinder baffles, and the need for high-tension ignition maintenance when considering the installation of airscrew turbines.

"The noise level of airscrew-turbine engines," he added, "seems to be less than that of an equivalent piston engine, but this has to be proved in flight."



The Bristol Centaurus 130, paragon of high-powered radial piston engine installations.

The wartime Bristol exhaust system utilizing individual pipes and introduced to meet demands for glow-suppression, improved engine cowling and cleaned-up power plant exterior had proved far too noisy for passenger-carrying aircraft, said Mr. Owner, and a reversion had been made to the manifold exhaust collector. He mentioned by comparison that "the airscrew gas turbine exhaust efflux is inherently a smooth roar, but the problem of taking away the exhaust jet pipe rearward through the wing is by no means an easy one to solve unless the aircraft nacelles are dropped so as to allow the pipe to pass below the main spar."

For airscrew turbines on which only a small proportion of the total propulsive effort is derived from the jet pipe, it is possible "to bifurcate the pipe quite sharply and to permit the gas to emerge from a rectangular aperture in each side of the nacelle at a relatively large angle to the direction of flight. As the exhaust velocity is subsonic it is desirable to control the area of the jet pipe orifice so as to maintain a constant pressure-ratio condition throughout the engine at various altitudes, and this should be a fully automatic system."

(To be continued.)

FORTHCOMING EVENTS

Dec. 6th.—Reunion dinner; ex-members 194 Transport Sqn., Simpsons, Strand, W.C.2.

Dec. 7th.—British Interplanetary Society: "History of the 109-509 Rocket Unit." John Humphries. St. Martin's Tech. Sch., Charing Cross Road, 6 p.m.

Dec. 10th.—R.Ae.S., Bristol branch: "Some Notes for Future Reference," Dr. Roxbee Cox, Merchant Venturers Tech. Col. 6.30 p.m.

Dec. 10th.—R.Ae.S. (Belfast Branch); "Wind Tunnels." J. A. Kirk.

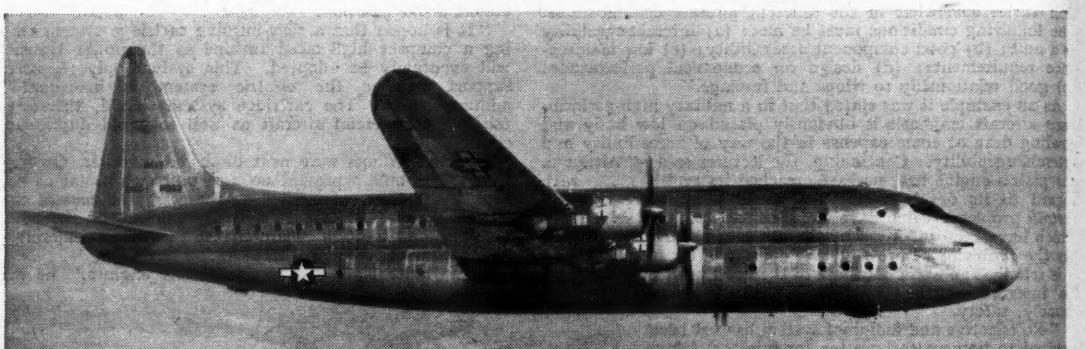
Dec. 11th.—R.Ae.S., London: "Photolofting." Mr. S. P. Woodley.

Dec. 11th.—R.Ae.S. (Southampton Branch): "Naval Aircraft." A. N. Clifton.

Dec. 12th.—National Model Aircraft Exhibition, Dorland Hall, Lower Regent Street, W.1.

Dec. 14th.—Society of Licensed Aircraft Engineers: "Some Aspects on the Growth of Civil Aviation." C. G. Grey, 26, Portland Place, W.1. 3 p.m.

CIVIL AVIATION NEWS



TRANSPORT PROTOTYPE : A new and attractive picture of the U.S. Navy's Lockheed Constitution flying over Muroc Dry Lake, where preliminary tests were carried out. This aircraft may be the basis for a large civil version—when and if more powerful engines are available. At the moment it is uneconomically underpowered for its size.

P.I.C.A.O. Navigation Recommendations : Private Flying Committee : "Official" Danger Areas

AIR VIEWS IN THE LORDS

THE first opportunity was provided in the House of Lords on Tuesday, November 26th, for their Lordships to speak their minds on nationalized British aviation. Lord Swinton's opening speech contained many questions connected with the functions of both the Ministry and Corporations.

The Minister, in his answers, assumed a responsibility to the charter companies which had not been expressed before. He went so far as to state that all the facilities which the Ministry could offer to private charter companies operating in their own sphere would be made available. There was a bargain, however, that there would need to be a reciprocal obligation on their part to line themselves up with the required standards of safety.

On the subject of British aircraft, Lord Nathan said that a C. of A. had been issued for the Tudors at a payload of more than 4,000 lb. Dealing with the Tudor II, he agreed that its all-up weight would be higher than originally estimated and that this might involve operational limitations on certain routes. Adequate facilities for heavy aircraft were not available yet south of Nairobi on the African route or east of Calcutta on the Far Eastern route. He added that " negotiations were in progress " over orders for the Marathan I and II, and that design work was proceeding on both the D.H.106 (Brabazon IV) and the Avro Brabazon III.

Air Safety Board

Lord Nathan lays great stress on the need for safety in the air, and in this connection announced the establishment of an Air Safety Board. The Board would be responsible for keeping under continuous review the needs of safety in British civil aviation, for recommending measures to promote safety in the operation of British civil aircraft throughout the world, and for the efficiency of the ground facilities provided for civil aircraft of all nations operating over the United Kingdom.

The powers of the Board will be limited to the initiation of action only in case of urgency, but it will have complete freedom in the study of all aspects of air safety. Members of the Board are to be Air Chief Marshal Sir Frederick Bowhill, Lord Brabazon of Tara and Air Vice-Marshal Collier. No further details of the composition of the Board was given, but mention was made of the introduction of a fourth member. The decision to create such a board must have been reached after agreement by the Defence Departments that the M.C.A. must be ultimately responsible for the control of air traffic over the U.K., although only civil aircraft are mentioned in the terms of reference. The Services will, presumably, therefore, be represented. Lord Nathan also outlined the new private flying committee, details of which are given elsewhere.

Lord Nathan hoped to establish the Air Transport Advisory Council, the statutory body to be set up under the Civil Aviation Act, at the beginning of next year. In the meantime, he intended to create a National Civil Aviation Consultative Council to assist the Minister " in the discharge of his particular functions." Members, he said, would be drawn from operators, constructors, users and the general public.

During the debate Lord Amherst referred to the Minister's safety campaign and insisted that a prerequisite was order in the air, and that to establish order in the air we required a uniform system of navigation and also the controllers empowered to enforce the regulations or to know the reason why. He advocated the use of Gee in those countries over which our aircraft would fly until the time when P.I.C.A.O. standardization became effective—if, that is, those countries could be persuaded to adopt the scheme. Lord Amherst suggested that a fourth Corporation should be created to manage the airports and run those ancillary undertakings which the Ministry proposed to establish.

Lord Strabolgi, who has flown in many parts of the world this year, paid a high tribute to the general efficiency of the British airlines. He drew comparisons between the treatment passengers received at the hands of the Corporations, which was outstanding in comparison with that offered by the foreign companies.

In winding up the debate Lord Swinton made an appeal for the abolition of the present procedure for the purchase of new aircraft. As Lord Nathan explained, the Civil Aircraft Requirements Committee studies the details of the requirements of the Corporations as put forward by the latter. The Ministry of Supply, as an agent, then places the order. Lord Swinton considered that that Ministry had no responsibility, yet it interfered, and, in his own words, " the sooner he (the Minister) and his colleagues shed the Ministry of Non-Supply in this matter of aircraft, the better it will be for British civil aviation."

HEATHROW DIVERSION

THE Ministry of Civil Aviation are taking over the R.A.F. Station Blackbushe, near Camberley, essentially for the purpose of experimenting with the fog dispersal apparatus which is installed there and which, we hear, had been sadly neglected by Transport Command.

The experiments will be made to investigate the cost of running Fido against, of course, the relative usefulness of the scheme as a visual aid for airliners in conditions of fog. While these experiments are progressing Blackbushe will be a normal diversion airfield for Heathrow. British Aviation Services will use the airfield as the base for their ferrying services, and it is quite possible that Customs facilities will be provided.

INSTONE COMES BACK

THOSE who have been concerned with aviation during the past twenty-five years will remember Instone Air Line which did sterling work in the 1919-1923 era. This concern, for instance, was the first to put its pilots into uniform—causing a good deal of humorous comment—and the first to name its aircraft. In 1924 all the companies were merged into the single Imperial Airways—a performance repeated in 1940 when B.O.A.C. was formed.

Now, after a gap of a quarter of a century, the shipping concern, S. Instone and Co., which backed the original airline company, has come back into the air transport business. Under the name of Instone Air Lines 1946 (Malta), Ltd., they are planning to operate a passenger and freight charter service between this country and Malta. The chairman will be Capt. Alfred Instone, who was one of the founders of the original airline. Initially at least, the service will be flown via Marseilles or Lyons, and Sardinia. Airspeed Consuls will be used and the company will work in close co-operation with B.O.A.C.

NAVIGATION AIDS

ON November 23rd, in Montreal, the Radio Technical Division of P.I.C.A.O. concluded the discussions on the merits of the various navigational systems which had been demonstrated to the delegates in the United Kingdom and the United States. Some important observations and recommendations were made.

Dr. Warner, president of the P.I.C.A.O. council, in his address, claimed that the recommendations would contribute to safe, regular and efficient flight, while at the same time the way would be left open for the development of new types of equipment and technique. Both the United States and the United Kingdom had pledged that their governments would do everything to facilitate the exchange of manufacturing rights on favourable and convenient terms, and would oppose the standardization of equipment over whose production there would be any national or commercial monopolistic control.

The Division found that the best instrument approach and landing aid currently available was SCS.51, a localizer glide-path system which has been described in *Flight* on several occasions. It was recommended that this system should be installed at all international airports as soon as possible and, in any event, not later than January 1st, 1951. Some means of measuring distance precisely should be added as soon as possible, and ground radar equipment was to be provided at those airports where the density of traffic was sufficient to make it useful. Development work was to be continued with the object of producing an instrument-landing system in which the aircraft would be controlled automatically during the approach and landing.

For short-range navigation the Division was unable to find any device which was sufficiently proved to justify universal adoption. The recommendation was made, however, that V.H.F. omni-directional range-beacons and distance-measuring equipment should be installed as soon as possible on the international trunk routes for operation at least until 1955. The locations of these installations are to be decided at the regional P.I.C.A.O. meetings. Development is to continue and special attention is to be paid to the aids for those areas of high traffic-density.

Low-frequency Loran was considered by the Division to meet most nearly the requirements for long-range navigation. Loran is installed and in operation on some of the more important trans-ocean routes, and the Division recommends that the existing stations should be retained, with all other long-range systems now in operation, until the time when one standard system may be adopted. A priority list was made for the installation of Loran in the following regions: North Atlantic—to be installed by January, 1949; and South East Asia and Australasia, Africa, the Pacific Area, and the South Atlantic—all in 1951.

In order to expedite and control the movement on the ground of aircraft and surface vehicles in conditions of poor visibility at airports, the Division has recommended the use of high discrimination radar which will determine the position of these aircraft, vehicles and obstacles. It recommends also that research should be continued on inductive signalling systems, but that in the meantime communication between aircraft, vehicles and control should continue primarily by R/T, as at present. The recommendations of the Division will be presented for approval in due course to the interim council of P.I.C.A.O.

The United Kingdom delegation made a statement at the end of the discussions that they were satisfied that the special Radio Technical Division of P.I.C.A.O. has done valuable work and had reached wise conclusions. The United States delegation made a similar statement, and observed that it was preferable to continue service trials on several promising systems in order to provide adequate knowledge and experience on which to base temporary standardization, and that standardization could not yet be final in the two fields of aviation and radio which were still being developed.

Sir Robert Watson Watt, chairman of the United Kingdom delegation, described the wartime use of GEE in a broadcast address, and claimed that R.A.F. Bomber and Transport Commands had made more returns to base on GEE in conditions of low visibility than had been made on any other one system in the whole world.

ENCOURAGEMENT FOR THE AMATEUR

IN the course of last week's House of Lords' debate on civil aviation, Lord Nathan publicly stated, for the first time, that a committee was being formed to advise him on the whole question of private flying. Surprisingly enough—remembering the way in which the value of club-trained pilots to the R.A.F. has been repeatedly denied in high quarters—he opened his statement by saying that "the private flying clubs were responsible for producing some of the finest pilots serving with the R.A.F. in the last war," and that he was anxious to encourage both private flying and gliding.

The new committee will be representative of all the interests closely concerned with club and private flying, and will pay special attention to the development of light aircraft suitable for the different purposes. As far as the gliding clubs are concerned, Lord Nathan said that he was anxious to encourage them as a means of providing the cheapest facilities for the greatest number of interested people. Mr. Whitney Straight, the chairman of the Royal Aero Club, will also be chairman of the committee. In the meantime—since the fact has already been mildly publicized elsewhere—it may be said that an informal committee has been at work for some weeks in an effort to draft the outlines of light aircraft which might justifiably go into production for use both by clubs and private owners.

RED FOR DANGER

WHEN examining the latest edition of the M.C.A. map showing the danger areas in and around this country, we are reminded very strongly of the story about the little boy who cried "Wolf." Although, as the relative *Notice to Airmen* explains, these areas have been considerably reduced in number since the publication of the previous edition of the map, there are still far too many of them. And, unfortunately, the climax of the wolf story still holds good; the little boy was finally gobbled up and nobody came to his rescue.

In fact, there are so many "danger" areas covering so much of the coastline that nobody can be expected to take any serious notice of them. Who, for instance, is going to

DISTINGUISHED DUTCHMEN. Mr. Albert Plesman, President-Director and founder of K.L.M., greeting Commander K. D. Parmentier on his return from the Company's first proving flight to South Africa. Parmentier, with the late Commander Moll, was second with a DC—2 in the 1934 race to Australia.

CIVIL AVIATION NEWS

ON THE LINE. The Bell Aircraft Corporation started production this year of the initial five hundred Model 47 helicopters designed for commercial use.

avoid the entire Channel area between Brighton and Torquay, for a distance, seaward, up to thirty-five miles, just because it happens to be marked as being dangerous up to a height of 30,000ft.? Certainly not Channel Islands Airways. Yet, if it really *is* dangerous, then C.I.A. must obviously, in flying from Southampton to Guernsey and Jersey, avoid this area at any possible expense in time and fuel. A glance at the map will show that, if danger areas are really to be avoided, hardly a single straight-line coast-crossing flight is possible anywhere.

One cannot blame the Ministry of Civil Aviation; they have been given the position and extent of the areas, and must forthwith put the machinery in motion to ensure that all pilots are warned. This they have done. But we feel that an effort should be made to discover which areas really *are* dangerous day by day. Whereas a few marked areas would be studiously avoided, a very large number, blotting out most of the coastline, can only be laughed aside—even though there is the chance that over one or two of them a shell will actually come up through the cabin floor. "Wolf" should only be cried once or twice, but then very loudly.

PREMATURE?

BRITISH EUROPEAN AIRWAYS has asked the Ministry of Supply to obtain for them three Sikorsky and two Bell helicopters, which will be used for "experimental services." Since the present available types have accommodation for only one passenger who, at least in the case of the Sikorsky, is somewhat surrounded by the complicated machinery of helicopter operation, one cannot feel that these "services" will be very serious ones, while, at the present cost of helicopters, the patient taxpayer is being asked to foot a large bill for a very doubtful direct return.

Nevertheless, it is a good thing that one of the Corporations should take an interest in helicopters and thus obtain both technical and flying experience of the types at present available. For this purpose, however, only one of each type would surely be required. Later, perhaps, when real transport helicopters are available, the situation will be different. It should be added, however, that the helicopters to be purchased will be made under licence in this country and will not be merely imported.

AMERICAN AIRLINES TEST G.C.A.

THE American Civil Aeronautics Administration have arranged with the Army Air Forces to provide Ground Controlled Approach equipment at three airports—New York, Washington and Chicago. Tests are to be made by the Administration of the suitability of this system for the control of air traffic and as a blind-landing and approach aid. The installation costs will be met by the Air Transport Association in conjunction with the C.A.A.

It is understood that the equipment is the most modern used by the Army Air Forces, and consists of a mobile trailer on the airfield and radar screens located in the airfield control tower. The tower controller will, consequently, control all aircraft within a thirty-mile radius of the airfield, and he personally will direct aircraft requiring blind-landing guidance. The tests should start early next year.

SERVICES IN INDIA

AIR-INDIA (erstwhile Tata Air Lines) are now operating their Bombay-Nagpur-Calcutta service on a daily frequency, using Douglas DC-3s. The Bombay-Delhi schedule has been increased to ten services a week, and by the end of the year it is hoped that a twice-a-day service will be possible. Similarly, the Bombay-Karachi service, which, at the moment, is operating eleven services a week, should be increased to two a day by the end of the year. The Bombay-Colombo service is operating daily.

The passenger rate has now been reduced to the minimum of 3 annas a mile as laid down by the Government of India. The Government permits airlines to operate at charges between 3 annas and 4½ annas a mile.

CHRISLEA PREPARATIONS

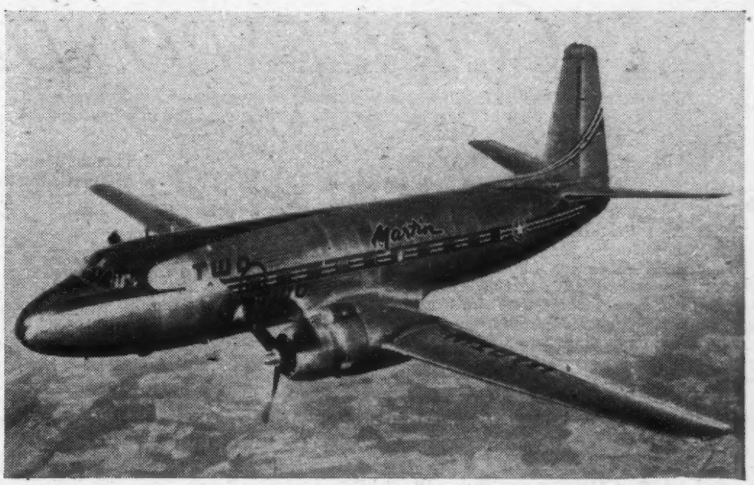
WITH the prototype Ace moving satisfactorily through its test programme, and preparations for its production almost complete, only something which might be described as "political" stands in the way of its reasonably early appearance on the market. At the moment, the work is being continued in part of a hangar at Heston, but Chrislea Aircraft has made arrangements to move into more expansive quarters at Exeter airfield, where comparative quantity production will be possible. Unfortunately, there appears at present to be something of an official hold-up over the move.

The recent bad weather has tended to slow down the test work by Mr. Stedman, but the Ace is now flying well with its twin fins and rudders and with a considerably reduced dihedral. Apparently there are no intrinsic snags in the three-in-one control system and very shortly the firm proposes to try it out on both an entirely inexperienced amateur and a very experienced professional. The former should, one feels, be someone with an hour or two of dual, or with ample passenger flying hours, so that he is not without air-sense, but should not be a pilot who has already become imbued with any normal reflexes. Mr. Stedman, incidentally, in spite of long experience with conventional controls, picked up the knack very quickly, and the system has considerable theoretical advantages, both for the novice and the more experienced owner. The fact that he managed to cope with the Ace on its first flight, when, with only a single rudder, it was found (to put it mildly) that there was no directional control at all, certainly suggests that there is little wrong with the system. Owing to a "technical hitch" in the control operation of the prototype, the ailerons are, for the present, irreversible and stay where they are put. This fault will be ironed out easily enough, and is not, in any case, a fundamental difficulty—it merely makes accurate lateral control in rough weather

CIVIL AVIATION NEWS

rather less easy than it might otherwise have been.

Apart from certain structural modifications to reduce weight and to simplify manufacture and replacement, the production type will differ from the prototype only in details such as control surface shapes, cabin planning and trimming methods. The tricycle works extremely well in spite of its apparently short wheelbase, and there has been no sign of nosewheel shimmy even on rough grass surfaces. Of the production design plans, little may yet be said, but these are very interesting indeed and involve both the more extensive use of welded steel construction and the simplification of the methods used in order to reduce manufacturing time and to enable section replacements to be made easily.



AMERICAN FEEDER TYPE: The prototype Martin 202 has made its first flight at Baltimore. This thirty-passenger transport is the first of a new post-war series of American civil types and shows an interesting size-trend. Needless to say it has a tricycle undercarriage.

THE CONSTITUTION

(*A new photograph on page 628*)

FEW technical details have been published about the Lockheed Constitution, which was designed specifically for the transportation of American Navy personnel and cargo over great distances. One of the requirements was that the aircraft should be able to operate economically and with a small crew. Some of the island bases in the Pacific will probably soon be evacuated by the American Navy, and a long-range aircraft will be required to fly non-stop over those bases which are at present necessary as refuelling stops for smaller four-engined aircraft.

The wing span is 189ft, and the fuselage is 156ft long. Tunnels in the wings allow the crew to inspect and adjust engine accessories whilst the aircraft is in flight, and it is estimated that most mechanical, electrical and hydraulic adjustments will be possible in the air. The fuel capacity of 10,000 gallons in four wing tanks—one tank to each engine with a cross-transfer system—is said to give the aircraft a range of between 6,000 and 7,000 miles. Take-off in calm air, at sea level and at an all-up weight of 184,000 lb, is claimed to be less than 800 yards, and, using the inboard reversible airscrews after landing over a 50ft obstacle, the aircraft may be brought to a standstill in approximately the same distance. Thermal anti-icing is incorporated in the wings and tailplane surfaces. Fowler flaps are fitted, bringing the stalling speed down to 80 m.p.h.—which is very low for an aircraft of such a size. The controls are power-assisted. The carrying capacity is over 69,000 lb and provides for ninety-two passengers on the upper deck, and a cargo-carrying space of more than 7,000 cu ft on the lower deck. Presumably these figures will only be applicable to the Constitution when it has eventually been fitted with more powerful engines, and these can only be airscrew-turbines. For how long the manufacturers will need to wait for them remains to be seen.

AIRLINE PILOT

(*Concluded from page 619*)

be paid for the risks of his job? The glamour of the pilots' brevet has a commercial value only as a badge of competence. Civil aviation, like everything else, has got to pay or go out of business. In the long run, pilots will be paid according to their worth in the labour market.

This seems an appropriate moment for an expression of opinion on this question of status by the members of the profession themselves. The British Air Line Pilots' Association would seem to be the vehicle for such a statement. The closed shop is a popular anathema at the moment, but it has its points, viewed from the inside (as doctors, dentists, architects, engineers and others will admit), and even from the outside, too, when professional standards beget good practitioners. Apart from pay, there is also the question of recruitment. How is it proposed to find aircraft captains in future? Are the Corporations to be the civil outlet for R.A.F. pilots "no longer required"? Or is a proper scheme of apprenticeship to be developed, where the young man could start as a boy, really learn the business in all its aspects, and gradually climb the ladder, so that, when he eventually becomes a skipper, he knows all the answers? Who will be the arbiter of his fate? His own association or, as in the old days before the war, the insurance companies?

These questions must be faced. If the fare-paying public gets the idea into its head that the personnel of civil aviation are on the down-grade, its members will go by boat—and who will blame them? How many of the recent crop of accidents have been due to bad airmanship? Do not let us delude ourselves into the wishful thought that great things can be achieved by anything but the very best of material. G. M. M.

BREVITIES

During a recent trip to Barcelona to obtain some of those tangerines, a London Aero and Motor Services' Halifax was intercepted by a Messerschmitt 109G on crossing the coast. Although the 109 sheered off after examining the Halifax, to the crew the whole affair must have been uncomfortably reminiscent of old times.

* * *

In the list of refuelling airfields published in *Flight* of November 7th, Cambridge airfield was noted by the Petroleum Board as being able to supply 73 octane fuel. Actually, 87 octane is also available from Marshalls.

* * *

Another special car hire service—this time primarily for the benefit of charter companies and their passengers—has recently started operations. This is Humber Hire Service, Warrington Road, Croydon, and the organizers, Messrs. Vaughan and Whittemore, have for some time been acting as freelance radio operators with different charter firms. The cars used are seven-seater Humber station wagons and the charge is 1s a mile.

The Ministry of Civil Aviation has announced that, on the recommendation of the A.R.B., a Certificate of Airworthiness has been issued for the Tudor I.

* * *

Substantial holdings in the Pan African Air Charter and Air Trans-Africa Companies have been taken over by New Union Goldfields. This merger has, in effect, probably produced one of the largest privately owned airways systems in the Empire.

* * *

Lord Nathan accompanied by Sir Harold Hartley, Chairman of B.E.A.C., and several M.C.A. officials, made an official visit to Scotland last week. Calls were made at Renfrew, Turnhouse and Prestwick.

* * *

The Minister of Civil Aviation has announced the appointment of Mr. Vincent Alford as Chief Information Officer to the Ministry, as from January 1st, 1947. Mr. Alford has been on the staff of the B.B.C. for many years, and since the war has been in charge of Forces educational broadcasts.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

AIR SEARCH

Nelson's Method Still Effective

THE recent loss of an American Dakota in the Alps directs interest towards methods of search from the air.

It is noteworthy that the crashed aircraft was found at last by a Royal Air Force Lancaster when many aircraft of four other nations had failed in this aim after many hours of flying. Perhaps it is significant that the Royal Air Force employs the methodical searches originally devised by Nelson.

In these days of progress (*sic*) it is a striking thought that the winning of the Battle of the Atlantic was in no small measure made possible by Coastal Command's diligent application of tactics evolved more than a century before. It may be said with justice that Coastal Command shares with the Royal Navy in Nelson's great heritage. BRISTOL, 142.

ULTRA-LIGHT AIRCRAFT

Obstacles Deliberately Put in the Way

THE letter from Mr. E. J. Pope (*Flight*, November 7th) is typical of the troubles experienced by many other enthusiasts who are building their own low-powered aircraft and those who wish to fly them. It would seem that obstacles are deliberately put in the way of those who should receive encouragement and help.

I am afraid that the A.T.C. and the R.A.F. won't receive many volunteers when it is realized that they won't be able to make and fly their own little aircraft later on.

"The Magna Charta" of low-powered aircraft building and flying is the Gorell Report, and any attempts by Ministries to infringe the rights then granted should be fought tooth and nail in Parliament.

The whole matter was most thoroughly investigated at the time and a safe arrangement made.

ERIK T. W. ADDYMAN
(Hon. Sec., The Aircraft Club).

Luton-Minor and "Permit to Fly"

WITH reference to the letter of E. J. Pope in *Flight*, November 7th, it may interest him to know that I, also, built a Luton-Minor, just before the war, finishing it, in fact, too late to receive permission to fly.

Since my return to "Civvy Street" from the R.A.F. I have been in communication with the Air Ministry regarding a "permit to fly," but have been given to understand that ". . . it is by no means certain that it will be possible to reintroduce this pre-war practice."

I take it that this must apply to all ultra-light types, and wondered just how many enthusiasts have been similarly grounded by this edict.

I have flown the machine twice—permit or no—and found it very sweet to handle, though a bit underpowered with the Carden engine.

A "permit to fly," even with all the pre-war restrictions, is all that I want—C. of A. is too expensive—but I want it now, not at some vague, very future date, and I can see no sound reason for its refusal. T. N. WALKER.

AIRCRAFT MAINTENANCE

"Much Lower Than It was Pre-war"

IN a letter published in *Flight*, October 31st, the writer expressed his concern at the poor standard of maintenance that he found when carrying out his duties as an investigator of crashed civil aircraft.

The publication of this indictment was followed by a letter from the Secretary of the Air Registration Board (*Flight*, November 14th). The writer of the first letter was obviously deeply concerned about his discoveries and wisely remained anonymous, in case, no doubt, of possible repercussions. The author of such a letter might be disgruntled with his employers or, on the other hand, public spirited. I, personally, prefer to think that his motives are in the public interest. Let us not forget that a person licensed or approved as an inspector under the Ministry of Civil Aviation is bound by law to protect the public interest. The sole purpose of the Air Navigation Order is to protect the fare-paying public. Mr. Thomas's reply, expressed with some asperity, challenges the complainant to come out into the open and spill the "gen." I rather feel that it would hardly be fair to expect him to do this as his job and his future might depend on it.

Coming down to brass tacks; can a man serve two masters—his employer who pays his salary, and the public who doesn't know he exists? I think he can, providing the public and the employer both want the same thing.

Now from my experience, aircraft maintenance is at a much lower level than it was pre-war, and it is essential that it should be brought to a pitch where it can practically be discounted as a factor in crash investigation.

When the day dawns that aircraft operators realize and prove for themselves that perfect maintenance means saving money, then the licensed engineer, the A.R.B. and the aircraft operator can work hand in hand, with nothing mutually to hide, and between them iron out all the factors, whatever they are, that are contributing to the present "low" in the maintenance field. L. W. CRAWFORD.

SAGA OF THE SWORDFISH

Many Incredible Feats were Performed

THE letter from "On The Spot" (*Flight*, November 14th, 1946) at once reminded me of the controversy aroused by the memorable flight of the Hurricane from Edinburgh to London, pre-war, at 408 m.p.h. Some unbelievers whipped out their slide rules and proved it could not have happened: but it did.

May I say that many incredible feats were performed in the Swordfish, and that the data of some of these will never be revealed except by those who prefer not to have themselves—or perhaps their feats—quoted. However, if "On The Spot" will write to me personally I will put him on the trail. He can then buy the book, which, incidentally, was read by the Admiralty before going to press. B. J. HURREN.

PRIVATE FLYING

A.T.C. Cadets "Leaving in Dozens"

I READ the letter of your correspondent Peggy E. Riley (*Flight*, October 31st) with great interest. As a member of the Air Training Corps I should very much like to see some of the promises made to us come true. Our squadron was assured that a gliding course and a decent rifle range would be obtained for us, but that was three months ago and nothing has yet been done.

The Government has promised a great new expansion scheme for the A.T.C., but cadets are leaving in their dozens and the Corps is dying. How often have we been promised and then forgotten? Cannot something be done to put the A.T.C. on its feet again? If something is not done soon there will not be any A.T.C. left. A. E. PETITJEAN
(2093 Squadron, Air Training Corps).

OVERDUE AWARDS

Ministry's Treatment of Aircrews

ON reading *Flight*, October 3rd, I came across a correspondent's letter headed "Overdue Awards." Apparently ex-Flt. Lt. R. Clarke's award (D.F.C.) for successfully completing a tour of operations with Bomber Command was long overdue. May I raise a point re numerous "one tour men" now classed as redundant aircrews, serving overseas?

Owing to the majority of aircrew personnel being exceptionally young when they entered the Service, their "demob" numbers are naturally high. Many had completed a tour of "Ops" before attaining the age of 20 years. The only recognition once-called "Lords of the Air" require is award of their demobilization; surely something can be done to release productive aircrews soon. The job they came in to do was done—completed well over a year ago.

I believe Lord Portal said, "We can never really know what we owe to the aircrews who did the fighting and to the men and women who worked for them on the ground, in the desert, in the jungle and through the bleak nights of six English winters. Perhaps we owe the biggest debt to all our bomber

CORRESPONDENCE

crews. Night after night, and night after night again, hammering away at Germany; then long journeys home over the North Sea—for the lucky ones." Bomber Command alone won 19,000 decorations for gallantry and lost 47,000 killed.

The only decisions made by the Air Ministry up to date directly affecting survivors of the bombing campaign have been to stop their promotion, then to reduce all Warrant Officers and Flight Sergeants to the rank of Sergeant. Incidentally, aircrews were promised, at one time, their time promotion until they were demobilized.

A final gesture is to state that redundant aircrews still in the R.A.F. will lose their aircrew rank by next June, and at the present rate of demobilization numerous productive aircrew personnel will be in the R.A.F. about that time.

Finally, if redundant aircrews are so unimportant as to have their rank reduced every few months, why not release them now?

ANXIOUS PARENT

Decorations by Post

IT was with great interest that I read your article in *Flight* of October 10th, with the above heading, wherein you gave the form which applications for the issue of decorations should take. It has occurred to me that those men who earned such decorations did not consider it necessary to conform to a prescribed formula before carrying out those deeds which earned the award of their decorations.

Of the present feeling in relation to services rendered, Mr. Rudyard Kipling wrote:—

> "O! it's Tommy this, an' Tommy that, 'an 'Tommy, go away';
> But it's 'Thank you, Mister Atkins,' when the band begins to play. . . .
> Then it's Tommy this, an' Tommy that, an' 'Tommy, 'ow's yer soul?'
> But it's 'Thin red line of 'eroes' when the drum begins to roll. . . ."

ARTHUR JORDAN.

ALL IS "TRONS"

Some Supersonic Thoughts on the Universe

REFERRING to your Correspondence in *Flight*, November 21st, relative to "Supersonic," without entering deeply into the realm of natural philosophy, it is interesting to consider the universe as "Trons" in perpetual vibration, i.e., "Trons" vibrating at 482 billions of cycles per second appear to us as the colour red; those at 542 billions of cycles per second as yellow; those at 707 billions of cycles per second as violet; while X rays, Y rays and cosmic rays are of an even greater frequency.

The high frequencies are invisible but may be felt, the lower light frequencies are not only visible but felt as heat, and the lowest frequencies most probably insensibility and death. All matter fatigues due to these vibrations and in time responds only to the lower vibrations.

Critical periods of vibrations occur due to the superimposition of one frequency of vibrations upon another, causing a resultant lower frequency of vibration with disastrous results. Interaction of one vibrational frequency lagging behind another causes an increased frequency of vibration and eventually heat and light (fire).

In ether and space as we understand them, the vibrations would be at astronomically high frequencies—higher than the frequency of cosmic rays. The question of vibration and its effect upon the fatigue of matter (men and material) is of great interest in the present aeronautical era.

W. REGINALD DAINTY
(Hon. Capt., R.A.F., R.N., etc.).

"What d'you mean—putting it in? I'm taking it out."

"YOU CAN'T GO WRONG"

The Barracuda Had Replica Controls

WITH reference to your footnote on Mr. Powner's "You Can't Go Wrong" (*Flight*, November 21st), we would like to point out that "replica" shapes for control levers were used on the Barracuda.

The control knobs for the undercart and deck hook were made in the shape of a wheel and hook; whilst the flap control was identifiable by having through it a horizontal bar.

BARRA-BOYS, F.A.A.

REPLACING HESTON

What is the Matter with Elstree?

WITH reference to the paragraph in *Flight*, November 14th, dealing with the replacement of Heston as the London Flying Centre, what is the matter with Elstree Airfield (late Aldenham), situated only twelve miles from Baker Street along the Watford By-pass and already the home of a thriving flying club and charter organization?

This airfield, with its 1,050yd runway and prospects of early development, should be the answer to the private owners' prayer.

C. A. NEPEAN BISHOP.

BOOKSHELF

Climax in Crete. By Theodore Stephanides. Faber and Faber, Ltd. 8s 6d net.

THEODORE STEPHANIDES is a doctor and has set down in a becomingly dispassionate and analytical—though far from uninteresting—manner, his story of the Battle of Crete. His observations make a valuable addition to the history of this significant operation.

Low Attack. By Wing Commander J. de L. Wooldridge, D.F.C. and Bar, D.F.M. Sampson Low, Marston & Co., Ltd., 15s net.

MANY of the war's most exciting air attacks were those made at low-level by light bombers of the R.A.F. They were exciting because of the "grandstand" view afforded to the participating crews; because of the special nature of the targets attacked; and also because of the keen sense of danger which the crews must have experienced, despite the characteristic nonchalance affected by those who returned.

A few raids such as the daylight attack by Mosquitoes on Berlin in January, 1943—timed to interrupt speeches by Goering and Goebbels—were made for their nuisance and propaganda value. A large proportion were primarily made because pinpoint accuracy in daylight seemed the only way to ensure destruction of the small but vital military and industrial targets. Perhaps the most spectacular raids of all were those typified by the attack on the Gestapo headquarters in the heart of Oslo on September 4th, 1942, where a single misplaced bomb might have caused severe suffering to the Norwegians.

In *Low Attack* Wing Cdr. J. de L. Wooldridge, D.F.C., D.F.M., presents a history of the exploits of two squadrons, Nos. 105 and 139, which specialized in low-level bombing. The book comprises a number of personal anecdotes describing the many successful raids made by these squadrons from the beginning of the war. A number of action photographs and drawings and some explanation and comment is also included. The foreword is by the wartime A.O.C. in C., Bomber Command, Air Chief Marshal Sir Arthur Harris, K.C.B., O.B.E., A.F.C.

Many members of the squadron will remember with pride their own exploits and those of their comrades as they turn the pages of *Low Attack*. Others cannot fail to be thrilled by the accounts of vital daylight attacks entrusted to a handful of unarmed "little heavies" depending solely upon speed and the pilots' skill to reach the target and return to their base at Marham in Norfolk.

SERVICE AVIATION

EMPIRE LIAISON : The Handley Page Halifax VI *Mercury*, of the Empire Radio School, equipped with the latest radar and wireless gear, has now returned to its base at Debden after a 29,000-mile two-month liaison flight to Palestine, Iraq, India, Burma, Singapore, Australia and New Zealand.

Royal Air Force and Naval Aviation News and Announcements

Mr. Churchill to 615 Squadron

WITH the opening of recruiting for the Auxiliary Air Force, Mr. Winston Churchill, who is Honorary Air Commodore of No. 615 (County of Surrey) Squadron, has sent the following message to the Commanding Officer:

"To 615 (County of Surrey) Squadron,

"Good luck to the air and ground crews joining the squadron. I rejoice that the future will inherit the splendid tradition of voluntary service forged in the perilous years.

"(Signed) Winston S. Churchill."

The Commanding Officer is Sqn. Ldr. R. G. Kellett, D.S.O., D.F.C. The squadron is a day fighter unit and is being equipped with Spitfires.

Royal Observer Corps

THE U.S. of S. for Air, Mr. Geoffrey de Freitas, gave some further details in the House on November 21st, concerning the Royal Observer Corps' future. He said its training would largely be in recognizing, reporting and plotting aircraft.

The Corps, it is understood, will not provide a permanent network of manned Observer posts. Part of its training will take the form of periodic exercises with the R.A.F.

Initially, the Corps will begin training where it left off at stand-down, but its methods and technique will almost certainly change to keep pace with developments in raid reporting and operational needs.

Battle of Britain Gifts

BATTLE OF BRITAIN anniversary gifts received by the R.A.F. Benevolent Fund from overseas include £56 from Cairo churches and £5 from Estoril, Portugal.

Canteen's Christmas Box

THE Stage Door Canteen in Piccadilly, which has already entertained 2,500,000 men and women of the Forces, has been enabled to carry on over Christmas and the New Year by a donation of £2,000 from the Dunlop Rubber Co., Ltd.

R.A.F.A. Meet in Hong Kong

AIR COMDRE. WEBSTER, C.B.E., A.F.C., Air Officer Commanding Hong Kong, was unanimously elected president of the local branch of the Royal Air Forces Association at its recent inaugural meeting and dinner held in the Gloucester Hotel, Hong Kong. Also present was Air Comdre. Worthington, C.B.E., who was visiting the island.

Members, serving and ex-Service personnel of the R.A.F. and R.F.C., reached several decisions about the future of their branch, the formation of which has been approved by the general secretary of the Association.

Four New R.A.F. Branches

FOUR new branches, Aircraft Control, Catering, Provost and Physical Fitness, will be set up in the R.A.F. on January 1st, 1947, and will provide further opportunities for airmen to achieve commissioned rank and longer careers in the Service. Except in the Aircraft Control branch, which will absorb certain flying personnel, the other new branches will also provide opportunities for short-service commissions. Ex-regular airmen who have been given emergency commissions may apply for transfer to one or other of the new branches.

The Aircraft Control branch will embrace fighter control and raid-reporting organizations and air traffic control work. A high proportion of the posts in the air traffic control organization will be filled by general duties officers. Normally, in future, officers for this branch will be chosen from long-service aircrew of the pilot and navigator categories.

Airmen cooks who hold the Diploma of the City and Guilds Advanced Cookery Course will be an important source for recruiting permanent officers

for the Catering branch, but in the immediate future permanent officers will be selected from those who have served on catering duties during the war on emergency commissions. The formation of a separate Catering branch recognizes the importance of efficient catering arrangements and reflects the need for maintaining and if possible improving messing standards brought about by the introduction of catering specialists during the war.

Provost officers will be mainly recruited from airmen R.A.F. Police who will be commissioned after O.C.T.U. training.

Physical Fitness officers will be mainly recruited by direct entry from civil life to short-service commissions, a small proportion of them being later specially selected for permanent commissions, and a limited number of permanent commissions will be granted to Physical Training N.C.O.s.

R.A.F. Secretarial Branch

A NEW R.A.F. Branch, the Secretarial Branch, will be established on January 1st, 1947, for administrative duties for which a flying or technical background is not essential. It will open up further opportunities for permanent commissions to serving airmen, to young men under 19 who succeed in the common Services Entrance Examination and Selection Tests, and to R.A.F. Administration apprentices. A special wing of the R.A.F. College will be set up to train the latter two types of entrants to permanent commissions in this branch.

Short-service commissions will also be available to serving airmen who will be considered for permanent commissions while serving on short-service commissions.

A wide variety of posts will be open to Secretarial officers, including air rank administrative appointments and command of certain non-operational units. About one-third of the intelligence posts will be filled by Secretarial officers who will also undertake Adjutant duties, and administrative and Record Office posts.

The new branch will take over all the duties of the present Accountant Branch, many administrative posts formerly filled by General Duties branch officers, and many responsibilities of the Administrative and Special Duties Branch.

THE WAY OUT: On the Bristol Brigand torpedo-fighter there is a parachute exit aft of the torpedo. The installation of the dorsal gun—a 0.5 inch Browning—is also visible above.

BRITISH RESEARCH STATIONS

Royal Aircraft Establishment. Farnborough

Aerodynamics, Structures, Radio, Armament, Instruments, Electrics, Materials, and Controlled Weapons.

Telecommunications Research Establishment. Malvern.

Radio and Radar (Air Applications).

National Gas-Turbine Establishment. Whetstone.

Research and Development of Gas Turbines.

Research and Development Establishment. Cardington.

Balloons and Fabrics, Dinghies, Training Aids.

Air Torpedo Development Unit. Gosport.

Air Torpedoes and Underwater Weapons Carried by Aircraft.

Research Station. Orfordness

Air Ballistics of Bombs, Aircraft Vulnerability, Armour Penetration.

Aircraft and Armament Experimental Establishment. Boscombe Down

Acceptance-Testing of Land and Naval Aircraft, Armament, Equipment.

Marine Aircraft Experimental Establishment. Felixstowe.

Flight-Research and Acceptance-Testing of Seaplanes and Equipment.

Airborne Forces Experimental Establishment. Beaulieu.

Flight-Testing of Gliders, and Transports, Supply-Dropping Equipment, Helicopters.

The accompanying chart sets out the principal experimental establishments of the Ministry of Supply (Air). The scientific organization of the Ministry is the largest in the country, whether in the Government or industry, and embraces three large groups, dealing with Armament, Aircraft, and Atomic Energy, the three divisions being distinguished by the titles "Defence," "Air," and "Atomic Energy."

Before the war research and development was carried out in the Admiralty, War Office, and Air Ministry, and expenditure necessary to maintain research establishments was included in the votes of these Ministries. Except in the case of the Admiralty, however, the war led to a different arrangement. The Admiralty is still responsible for its own research, development, and production, although the Ministry of Supply still handles design and development of certain weapons and stores for the Admiralty, including aircraft. Former War Office responsibilities are now the concern of the Defence Division of the Ministry of Supply.

R.A.F. Permanent Commissions

THE following list of officers to be offered permanent commissions in the R.A.F. has been announced:—

GENERAL DUTIES BRANCH

Grp. Capt. A. C. Rawlinson, D.F.C.

Wing Commanders: L. H. Bartlett, D.S.O.; D. L. Cartridge, D.S.O., D.F.C.; D. B. Fitzpatrick; F. J. French, D.F.C., A.F.C.; J. C. Hunter; W. A. Laurie, D.F.C.; W. E. V. Malins, D.F.C., T.C.; T. C. Parker, O.B.E.

Squadron Leaders: A. S. Baker, D.F.C.; H. Coates, D.F.C.; P. G. J. Cranley, D.F.C.; W. A. Downes, D.F.C., A.F.C.; E. R. Dutt, A.F.C.; K. Fisher, D.F.C., A.F.C.; R. B. Fleming, D.F.C., A.F.C.; J. P. Geoghegan, D.F.C.; A. H. Gibbs; R. E. Glover, D.F.C.; J. F. Hacking, D.F.C.; P. J. Hearne, D.F.C.; J. S. Higgins, D.F.C.; J. E. Holland, D.F.C.; K. R. Hughes; L. D. H. Izzard, D.F.M.; H. T. John, D.F.C.; W. Laing, A.F.C.; E. P. Landon, D.F.C.; J. G. S. Linacre, A.F.C., D.F.M.; R. V. Potts, A.F.C.; D. B. Ross, D.F.C.; I. D. Roxburgh, A.F.M.; H. A. Scott, D.S.O., D.F.C.; S. A. Sharpe, D.F.C.; W. R. N. Sturdy, D.F.C.; C. R. Turner, A.F.C.; T. C. Wood, D.F.C.

Flight Lieutenants: H. A. Ashton, D.F.C.; A. G. Brown, D.F.C.; R. A. Carson, M.C.; G. A. Catling, J. R. M. Chapman; R. A. Cunningham; F. C. Dray; R. B. Game; E. Gillies; C. L. Godwin; B. Hamilton, D.F.C.; L. L. Harland, D.F.C.; W. D. Hooper; R. S. Kerby; D. S. Kirkland; T. Knight; F. R. Leatherdale, D.F.C.; D. C. Lowe, D.F.C., A.F.C.; C. L. C. Mason; R.

SERVICE AVIATION

Munns, D.F.C.; B. L. Patridge; W. S. O. Randle, A.F.C., D.F.M.; C. Scorer, D.F.C.; D. G. Webb, D.F.M.

Flying Officer: R. S. George.

TECHNICAL BRANCH

Wing Commander: R. V. Fiddick.

Squadron Leaders: P. C. Barnes; A. P. Crowley; A. H. Dormer; P. S. Gage; J. W. Gale; P. M. S. Hedgeland; I. E. Hill; C. T. E. Holloway; R. Jones; F. E. Ludgate; A. G. Morton; A. Singer; J. A. Theophilus;

Flight Lieutenants: G. S. Hall; J. H. Jenkins; G. A. Johnston.

Flying Officers: J. M. Faithfull; R. H. Johnson; C. B. White.

The great majority of these officers had previously been selected for extended service commissions.

A further list of officers to be offered permanent commissions in the Royal Air Force has also been announced as follows:—

GENERAL DUTIES BRANCH

Col. W. A. Nel, D.S.O., D.F.C.; Capt. W. E. Colahan; Capt. M. C. S. Shepherd. These officers were commissioned in the S.A.A.F.

Wing Commanders: J. Ellis, D.F.C.; J. V. Hoggarth; H. J. Maguire; C. G. S. Rowan-Robinson, D.S.O., D.F.C.; D. C. Torrens; H. B. Russell, D.F.C.; E. N. Ryder, D.F.C.; E. N. M. Sparks; D. M. Strong, A.F.C.

Squadron Leaders: J. W. Appleton; C. N. S. Campbell, D.F.C.; F. S. Davis; F. G. Dutton; I. W. Hutcheson, V. K. Jacobs (R.N.Z.A.F.), W. M. Nixon, D.F.C.; P. A. Ostle; G. H. Porter; C. K. Saxelby, D.F.C.; J. W. Stephens, D.F.C.

Flight Lieutenants: E. R. Abbott, D.S.O., D.F.M.; N. E. Canton, M.B.E., D.F.C.; J. A. Costello, D.F.C., D.F.M.; R. S. Gunning, D.F.C., D.F.M.; A. J. Madge, C. I. Rolfe; W. E. Thomas.

TECHNICAL BRANCH

Flt. Lt. A. D. Miller.

The majority of these officers had previously been selected for extended service commissions.

FOREIGN SERVICE NEWS

Shooting Star Carrier Trials

A SPECIALLY strengthened Lockheed P-80 Shooting Star has lately been undergoing flight trials from the carrier *Franklin D. Roosevelt* off the Virginia Capes. The tests included accelerated take-offs.

Home-built Swiss Fighter

SQUADRONS of the Swiss Air Force have long been equipped with French Morane M.S.406s and German Me 109s, but during the war a new type of fighter—the D-3802—was developed. This appears to embody features of the French and German machines. A Saurer (Hispano licence) 12Y engine driving an Escher-Wyss airscrew gives a speed of 375 m.p.h.

A Hundred Vampires and . . .

DURING December the Swiss *Chambres Federal* will make a decision concerning the purchase of the first series of 100 D.H. Vampires.

. . . A Hundred Harvards

SWEDEN has acquired "at a favourable price" one hundred American AT-16 trainers (Harvard IIs). The machines have been built in Canada for the U.S.A., and will be shipped to Sweden shortly. All are new.

"Lanc.-Size" Two-seater

HOWARD HUGHES' XF-11 twin-boom photographic reconnaissance aircraft, which crashed with such dire results to Hughes himself, measured 101ft 4in in span and was powered by two Pratt and Whitney engines of about 3,000 h.p. driving 8-blade contra-rotating airscrews. Eight cameras were to be carried and the designed ceiling was over 40,000ft.

SEAFARING STYLES: Two interesting new jet-propelled deck-landing fighter prototypes for the U.S. Navy. Top, the Chance-Vought XFGU-1. and below it the North-American XFJ-1 The Vought is made of a new material in which balsa wood is sandwiched between aluminium alloy sheets.

For High-speed Assault

IN *Flight* of November 21st brief details were given of the SE 2400, mentioned as a possible bomber for the French Air Force. Two Nene turbine-jets are to be installed, both in the fuselage.

It now appears that this machine will be in the "attack-bomber" or "assault," class, with a comparatively light bomb load supplemented by a heavy R/P armament.

B-50 Superforts

ORDERS have been placed by the U.S. Army Air Forces for an additional quantity of Boeing B-50 Superfortress bombers, developed from the B-29. Sixty machines of the new model, the first of which will be completed within a few months, have already been ordered.

The B-50 has 59 per cent more power than the B-29, delivered by four Pratt and Whitney Wasp Major engines of 3,500 maximum h.p. Curtiss-Wright reversible-pitch airscrews are fitted and a new light alloy, used in the wing, improves load-carrying capacity.

Enter the Electropult

BUILT by Westinghouse for the U.S. Navy, a linear electric motor more than a quarter of a mile long has been developed for the launching of jet-propelled and pilotless aircraft and heavy bombers from shipboard or from small airfields, without the initial impact of more conventional catapults. Called the Electropult, the device is essentially a huge electric motor laid out flat. The 1,382-foot track corresponds to the rotor and the small shuttle car which runs along it, and to which the aircraft is hitched, acts as the stator.

In a recent demonstration at the Naval Air Test Centre, Patuxent River, Maryland, the Electropult launched a Lockheed Shooting Star at 116 miles an hour in 4.1 seconds after a run of only 340ft. Unassisted, the machine would have required a run of about 2,000ft. Running free, without load, the shuttle car has built up a speed of 226 miles an hour in slightly less than 500ft.